# Environmental Risks of Condom Use: The Urgent Need for Green Policy Reform in Birth Control

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**Abstract.** Condoms are widely used as an effective contraceptive method to support reproductive health and protect children's rights through planned parenthood. However, their environmental impact, particularly as non-biodegradable waste, remains underexplored. Existing studies report that condom waste contributes to aquatic and terrestrial pollution, affecting biodiversity and ecosystem quality. This research aims to analyze the legal and ecological dilemma arising from condom use in family planning, and to propose alternative regulatory solutions. A normative legal method was applied, using statutory and conceptual approaches. Data were obtained through literature studies of relevant laws, journal articles, and previous research. The study found that condom waste disrupts aquatic ecosystems, harms soil structure, and introduces microplastics, with regulatory frameworks failing to address this specific issue. To overcome these challenges, the adoption of Extended Producer Responsibility (EPR) is recommended to obligate producers in managing post-consumption waste and promoting eco-friendly material innovations. In conclusion, an integrated policy reform combining EPR implementation, environmental-based product design, and public education is essential to ensure sustainable waste management while safeguarding reproductive health programs. This study is one of the first legal analyses to systematically examine condom waste and propose an EPR-based regulatory framework within Indonesian environmental law.

## 1 Introduction

Family planning has long been recognized as a key component of sustainable development and public health policy worldwide. Effective birth control not only contributes to maternal and child health, but also supports the fulfillment of children's fundamental rights to education, welfare, and proper upbringing. International frameworks, such as the Sustainable Development Goals (SDG 3 and 5), emphasize the importance of reproductive health and gender equality as prerequisites for achieving broader social welfare and environmental sustainability.

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Within the framework of family law, planning the number of children in a household is a very important aspect to ensure the fulfillment of children's basic rights, including the right to upbringing, education, and welfare [1]. Family law not only regulates the relationship between husband and wife, but also contains provisions regarding parents' responsibilities towards their children. The principle of the best interests of the child is a normatively binding basis in various national regulations, such as Law Number 23 of 2002 as amended by Law Number 35 of 2014 concerning Amendments to Law Number 23 of 2002 concerning Protection and Law Number 1 of 1974 concerning Marriage. In this context, the use of contraceptives can be seen as a preventive measure to ensure that the number of children in the family remains within the limits that can be guaranteed by the economic and social capabilities of the parents, so that there is no neglect of children's rights [2].

The use of contraceptives is not just a matter of controlling the birth rate, but can be seen as a strategic preventive measure to ensure that the number of children in a family remains within limits that are in accordance with the economic and social capacity of parents. Thus, children can grow up in an environment that guarantees the fulfillment of their basic rights, both in terms of health, nutrition, education, and emotional attention. Experimental research conducted by Maggio et al. in Malawi supports this assumption. The study showed that mothers who had access to family planning services after giving birth tended to have longer birth intervals, and their children grew healthier and experienced improvements in cognitive development [2].

One of the contraceptives that is widely used by the public because of its effectiveness, convenience, general availability, and low cost is condoms [3]. Condoms not only serve as birth control, but also as protectors against sexually transmitted infections, so their use is widely recommended in reproductive health programs [4]. However, behind these medical and social benefits, there is an aspect that is rarely discussed in the policy and legal literature, namely its impact on the environment. The results of previous research that discussed the environmental impact of condoms were research conducted by Birnbach et al [5], and Jawjit et.al [6]. The two studies found that from the production stage to the disposal of condoms, there is an impact on the environment. Approximately 90% of condoms' environmental impact comes from the production process and its aftermath (such as distribution and disposal). The majority of condoms on the market are made from synthetic latex materials and chemical additives that are difficult to decompose naturally, causing environmental pollution and an increase in the volume of waste in landfills [7]. This problem raises a dilemma between two equally important but contradictory goals. On the one hand, the use of condoms as contraceptives is a vital instrument in preventing unplanned pregnancies, thereby supporting the fulfillment of children's rights and parental responsibilities for the welfare of the family. But on the other hand, the non-biodegradable nature of condoms and their use of disposable nature contribute to the accumulation of non-organic waste, which is a threat to environmental sustainability. The tension between these two interests is important to be studied further, in order to formulate a balanced approach between the need for family protection and environmental responsibility within the framework of sustainable development. Therefore, this study seeks to address the question: How can Indonesian law reconcile the reproductive health benefits of condoms with their environmental risks? To answer this, the study aims to formulate a legal framework for managing condom waste through the application of the Extended Producer Responsibility (EPR) principle within Indonesia's sustainable development policies. This research is normative legal research that examines the dilemma between two conflicting interests, namely the importance of using condoms as part of birth control to support family welfare, and the environmental impact of these contraceptive products that contribute to environmental pollution.

This study uses a normative legal research method with legislative and conceptual approaches. The literature search was conducted systematically from July to August 2025 through academic databases and national legal repositories using relevant keywords related to reproductive health, children's rights, and condom waste. Sources were screened for relevance and credibility, and only materials directly addressing the legal and environmental aspects of condom use were included. The selected data were analyzed descriptively to examine the legal dilemma and propose policy alternatives based on the Extended Producer Responsibility (EPR) principle.

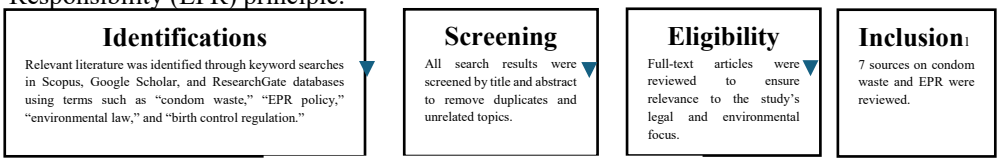


**Fig.1.** Flowchart of literature search

## 2 Condoms as Birth Control Instruments in the Perspective of Family Law

Family planning is not solely a demographic policy but a proactive legal and social strategy to guarantee that parents meet their responsibilities in delivering sufficient welfare and protection for their offspring. The state supports the notion of the child's best interests by regulating the number of children in alignment with the family's economic and social capabilities, as delineated in Indonesia's constitutional and family law framework [2].

The use of contraceptives, especially condoms, is an important part of a responsible family planning strategy. Within the framework of Indonesian family law, parents not only bear social and moral responsibility for the children they give birth, but also legal responsibilities that are expressly regulated in various laws and regulations. Constitutionally, Article 28B paragraph (2) of the 1945 Constitution of the Republic of Indonesia states that *"every child has the right to survival, growth, and development and has the right to protection from violence and discrimination."* This right carries the direct implication that the state, and even more so, parents, are obliged to plan the conditions of birth and childcare responsibly. Furthermore, Article 45 paragraph (1) of Law Number 1 of 1974 concerning Marriage as amended by Law Number 16 of 2019 states that *"parents are obliged to maintain and educate their children as well as possible."* This obligation is strengthened in Article 26 paragraph (1) letter a of Law Number 35 of 2014 concerning Amendments to Law Number 23 of 2002 concerning Child Protection, which states that parents are obliged and responsible to nurture, maintain, educate, protect and develop children. This step is directly correlated with the principle of *the best interests of the child*, which implicitly underlies various child protection regulations in Indonesia. The utilization of condoms as a contraceptive method is not merely a health or population policy initiative, but also constitutes a legal manifestation of parental obligation to safeguard the child's best interests. This obligation introduces a new aspect to consider the environmental consequences of condom waste, necessitating a balance among legal, social, and ecological accountability.

The use of condoms as contraceptives becomes relevant in the context of these legal responsibilities. By rationally arranging the birth of a child in accordance with the family's social, psychological, and economic conditions, married couples can optimally fulfill the rights of children, including the right to proper parenting and education. A study by Canning and Schultz states that families who have access to contraception tend to be more able to effectively allocate resources to their children. This study explores the effects of the sustainability of reproductive health and contraceptive services on development indicators, including extreme poverty, basic education, and women's empowerment. The results of long-

term research at Matlab reveal that access to family planning not only has an impact on the reproductive aspect, but also on the economic status and welfare of families. The women who received the services experienced increased income, assets, and body mass index, and their children received higher levels of education and improved nutritional status than families in the control area. This shows that the distribution of resources in the household becomes more optimal when the number and interval of births can be controlled. Legally, these scientific findings underscore the significance of contraception as a means to fulfill constitutional and statutory responsibilities for child welfare and gender equality. The utilization of condoms as a major contraceptive method presents regulatory problems related to waste management, underscoring the necessity to harmonize reproductive health policy with environmental law principles.

From a health perspective, the national law regulating the right to reproductive health has been guaranteed by Law Number 36 of 2009 concerning Health. In Article 71 paragraph (2) letter b, it is stated that reproductive health services include pregnancy management, the use of contraceptives, and sexual health. Furthermore, Article 72 emphasizes that everyone has the right to decide for themselves when and how often they want to reproduce, as well as have the right to information, education, and counseling related to reproductive health. More technical provisions regarding the administration and implementation of family planning programs are regulated in Presidential Regulation Number 181 of 2024 concerning the National Population and Family Planning Agency (BKKBN), which stipulates the duties of the BKKBN to formulate and implement technical policies, including the provision and distribution of contraceptives. At the medical operational level, the Regulation of the Minister of Health Number 2 of 2025 concerning the Implementation of Reproductive Health Efforts regulates in detail the procedures for pre-service, types, implementation, and evaluation of contraceptive services as a whole.

In practical terms, failure in family planning often leads to the neglect of children's rights, both in terms of education, health, and general welfare. The case reported by *Kompas.com* in May 2025 shows one concrete example: a family in West Java has eleven children who all do not receive formal education due to economic limitations and parental unpreparedness. In response to this, the Governor of West Java, Dedi Mulyadi, implemented a policy that requires the use of contraceptives for poor families as a condition for receiving social assistance. The case clearly shows that the absence of birth control not only has an impact on the family itself, but also leads to violations of children's rights to education and upbringing, as well as a wider social burden.

Based on the overall description above, it can be concluded that the use of condoms in the context of family planning has a strong legal foundation as well as social and moral legitimacy in the Indonesian legal system. It is not merely an individual choice, but part of the implementation of a broader legal and social responsibility to protect children from the risk of neglect and guarantee their right to a decent growth and development. In this case, contraception is an important instrument in building a healthy, prosperous, and legally and ethically responsible family.

## 3 Environmental Effects of Condom Usage

Today, male condoms are one of the most widely used methods of contraception globally. Generally, condoms are made from latex-based materials that are processed through the vulcanization stage to increase their durability and elasticity. In the production stage, several additional ingredients are used, such as fatty acids that act as binders and surfactants that function to stabilize latex emulsions. In addition, zinc oxide is added to protect the rubber from fungal attacks as well as the adverse effects of exposure to ultraviolet light. In order not

to oxidize easily and to prevent the formation of harmful compounds such as nitrosamines, manufacturers also mix antioxidants and accelerators into their formulas. The final product is then coated with a silicone-based lubricant, which is considered superior to water-based lubricants because the lubrication effect lasts longer [8].

Increasing public awareness of the importance of preventing unplanned pregnancies and the transmission of sexually transmitted infections has also encouraged the increase in condom use in various countries. In fact, according to the projections of Global Market Insights (2019), the global condom market is estimated to grow by around 8% in the period from 2019 to 2025 [6]. However, behind the success of promoting the use of condoms as contraceptives through public health programs, it turns out that environmental problems have not received much attention [9].

In examining the environmental impact of condom production and use, two important studies that can be used as a reference are the one by Jawjit *et al.* in Thailand and Birnbach *et al.* in Germany. Both use a *life cycle assessment* (LCA) approach to measure the environmental footprint of condom products, albeit with different focuses and scopes of analysis. Jawjit's study explicitly compared two main types of materials in condom manufacturing, namely natural rubber (*NR) and* synthetic polyisoprene (PI), while Birnbach's study focused on condoms made from natural latex.

The two studies agreed that the production and disposal phases are the stages with the most significant environmental impacts. Birnbach *et al.* noted that more than 90% of the total impact comes from production, packaging, transportation, and disposal. These findings are corroborated by Jawjit *et al.*, which found that the production phase accounted for 34%–73% and the disposal phase could account for 60% of the total impact. The added value of Jawjit's study lies in the comparative analysis of materials: the use of synthetic polyisoprene produces an environmental impact 1.5 to 2.5 times higher than natural latex, mainly due to the greater energy consumption in the mixing and washing process [6].

Jawjit *et al.* suggested substitution of electricity with natural gas in the dyeing process as one of the energy efficiency solutions. Meanwhile, Birnbach *et al.* emphasizing the importance of reducing packaging materials (aluminum and plastic) and optimizing post-use waste management. Based on these two studies, it can be concluded that although natural latex condoms are more environmentally friendly than synthetic condoms, their overall impact on the environment remains significant and needs to be addressed through more sustainable production design and responsible waste management [5].

An aspect that is often overlooked is the impact of condoms on the sanitation system and environmental health. Ehiri and Birley notes that improper disposal of condoms such as disposal through toilets, septic tanks, or open drains, has the potential to clog waste management systems and create breeding grounds for disease vectors such as *Culex quinquefasciatus*, the cause of filariasis [9]. This fact shows that the risks posed by condoms are not only physical as solid waste but can also trigger public health problems if not treated systemically.

To reduce these ecological impacts, various sustainable approaches have been developed. One of them was proposed by Bashpa *et al.*, which utilizes industrial condom waste as a reinforcing material in natural rubber composites [8]. This circular economy-based approach has been proven to produce good mechanical and thermal characteristics, while reducing the volume of inorganic waste [5]. This effort complements the energy efficiency and packaging reduction strategies as suggested by Birnbach *et al.* as well as the conversion of energy from electricity to gas as proposed by Jawjit *et al.*

In addition, material innovation is an important step towards a long-term solution. Boon *et al.* In his latest study, he outlined the development of biodegradable and *bio-based* synthetic rubber, which is developed from sustainable biological materials. The use of this material not only reduces dependence on petroleum-based polymers but also accelerates the

degradation process of post-use products. Thus, the combination of environmentally friendly materials engineering, circular economy practices, and sanitation policy reform can form a comprehensive strategic foundation in addressing the environmental impacts of condom use. Although the development of biodegradable and bio-based materials can be a promising long-term solution, in fact waste from condoms still dominates domestic and environmental waste streams. The large amount of condom waste contributes to a wide range of very complex ecological problems, especially in the water, soil and other biological attraction sectors. Therefore, there is an urgency to identify and elaborate the specific environmental impact caused by condom waste on these three components in order to determine the basis for developing an integrated mitigation strategy [7].

### 3.1 The Impact of Condoms on Water Pollution

Ren-Shou Yu & Sher Singh in their 2023 study noted that microplastics have a wide range of impacts on marine ecosystems, ranging from disruption of nutrient intake, physical damage, to decreased fertility in marine species and risks to human health. The consumption of plastic waste by marine life can result in sublethal effects that are still an area of scientific uncertainty but are estimated to have a negative impact on the physiological health, feeding behavior, and reproductive ability of affected species [10].

Furthemore, threats to ecology are not only limited to individual organisms, of course these threats can be transferred either vertically or horizontally in food webs that will be able to affect the population and other species through the attraction of predators of prey. Basically, these marine organisms ingest plastic particles from sharing pathways such as filtration, this is because organisms in the ocean think that the particles around them are food or known as trophic transfer which is caused by the consumption, attachment or attachment of particles to their prey.

This condition shows that the presence of condom waste in the waters is not only a sanitation problem, but also a significant ecological factor. When condom waste combines with other anthropogenic stressors, such as climate change and chemical pollution, the impact can exacerbate pressures on marine species populations, disrupt trophic interactions, and cause an overall imbalance of marine ecosystems[11], [12]. Therefore, it is important for environmental management policies to not only focus on reducing the use of conventional plastics but also regulating the management of disposable contraceptive waste that has not received much public attention.

### 3.2 The Impact of Condom Waste on Soil

Condom waste made from elastomeric materials such as synthetic latex has physical properties that are elastic, waterproof, and difficult to decompose naturally. If not managed properly, used condoms can pollute the environment, both aquatic and terrestrial. In the terrestrial environment, this waste can disrupt soil structure, including porosity and water infiltration, which impacts the moisture balance and respiration of the soil. In addition, condom decomposition products such as residual lubricants, dyes, and other chemical additives have the potential to negatively alter soil chemical characteristics. Research by Rillig and Lehmann shows that microplastics and elastomeric particles such as synthetic latex can reduce soil microbial activity, which is important for decomposition and soil fertility.

This finding is reinforced by the study of de Souza Machado et al., which confirmed that the presence of microplastics in terrestrial ecosystems can disrupt soil aggregate structure and microorganism activity, and trigger systemic ecological disturbances. Although these

studies do not specifically address condom waste, the similar physical and chemical properties of condoms to elastomeric microplastics make them relevant as potential terrestrial environmental pollutants that need special attention in waste management policies. Thus, the impact of condom waste is not only limited to reproductive health aspects, but also becomes part of a broader environmental issue [13].

Scientific attention to the presence of microplastics in the terrestrial environment is now increasing, after previously for more than a decade the focus of research was dominated by the issue of water pollution. According to Laurent Leberton and Anthony Andrady in their research entitled Future Scenarios of Global Plastic Waste Generation and Disposition, the study of microplastics in the terrestrial environment initially focused on toxicological tests on laboratory test organisms and specific soil parameters [14]. This is necessary to establish a preliminary understanding of the underlying mechanisms, as the characteristics of microplastics differ from other pollutants in that their impact is more mediated by physical parameters such as particle shape and size, rather than just by chemical toxicity. Interestingly, some of the effects of microplastics are sublethal or even nominally positive in certain contexts, although in the long term the accumulation of microplastic particles still has the potential to damage soil structure, reduce nutrient quality, and disrupt the balance of microecosystems.

It can be concluded that in the context of condom waste, which contributes to the entry of elastomeric microplastics into the terrestrial environment, its potential impact on soil fertility, land productivity, and groundwater quality is an ecological issue that has not been highlighted much. This condition strengthens the urgency of integrating contraceptive waste management into national and local waste management policies, while encouraging public education related to environmentally friendly disposal of condom waste.

## 4 Urgency Regulatory Approach in Condom Waste Management

If we refer to the previous discussion, it can be concluded that this condom waste will not only contribute to water pollution through physical and microplastic disturbances in aquatic organisms but will also have an ecological impact on soil quality. These findings show us that environmental problems caused by condom waste are cross-ecosystem and can have a long-term impact on survival. What is even more unfortunate is that so far there is no regulation that specifically regulates condom waste management. The waste management paradigm still focuses on general household waste and other conventional plastic types. Meanwhile, condom waste with synthetic elastomer content with chemical dipper content is neglected. This condition is the urgency of a more comprehensive and specific regulatory approach, which basically not only regulates the waste disposal system but also with an encouragement for producers to switch to environmentally friendly materials through policies based on the principle of extended producer responsibility (EPR). In addition, the regulatory approach by integrating public education on the intensity of use or in the realm of disposal must be carried out massively.

### 4.1 The Implementation of Extended Producer Responsibility (EPR) in Condom Waste Management

Environmental problems due to condom waste that pollute waters and soil show systemic weaknesses in the management of single-use health product waste. One of the policy approaches that can be applied to overcome this problem is through the Extended Producer Responsibility (EPR) scheme. The EPR concept places responsibility not only for the end

consumer, but also on the manufacturer for the entire life cycle of its products, including the post-consumption phase and waste management [15].

In this context, the application of EPR is particularly strategic for controlling elastomer plastic waste such as condoms, as it can incentivize manufacturers to develop environmentally friendly and biodegradable products. Supporting this direction, Boon et al [7] highlighted the promising potential of biodegradable materials for elastomer products, suggesting that EPR-based policies could drive contraceptive producers to adopt alternative materials with a lower environmental footprint.

In addition to encouraging material innovation, EPR schemes can also regulate condom waste recollection mechanisms through healthcare facilities, pharmacies, or special programs from manufacturers. This scheme has been implemented in several countries in the management of medical waste and single-use plastics with quite effective results in reducing the burden of environmental pollution. In Indonesia, the EPR instrument has actually begun to be introduced through the Regulation of the Minister of Environment and Forestry Number 75 of 2019 concerning the Waste Reduction Roadmap by Producers, but its implementation is still limited to packaging food, beverages, and other household products. Therefore, an integrated condom waste management system is needed and based on the principle of Extended Producer Responsibility (EPR). This scheme involves all actors in the production, distribution, consumption, and final waste management chain responsibly. To facilitate understanding, the following is presented with a systematic chart of the EPR-based condom waste management scheme:

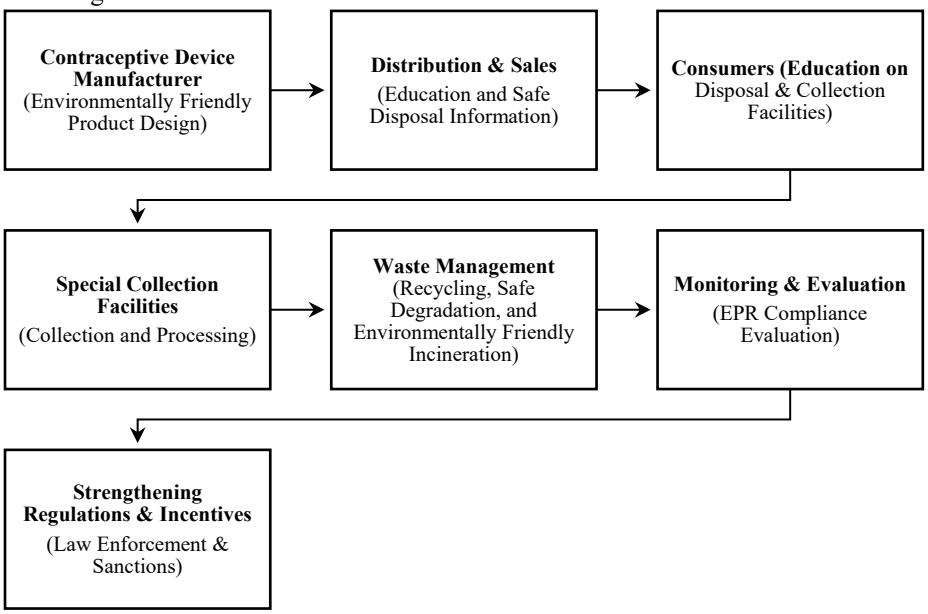


**Fig. 2.** EPR-based condom waste management scheme

This chart illustrates an Extended Producer Responsibility (EPR) based condom waste management system, where the responsibility for waste management is not only in the hands of consumers, but also involves producers, distributors, collection facilities, waste managers, and the government. The scheme includes eco-friendly product design, disposal education, dedicated collection facilities, safe waste treatment, and strengthening regulations and incentives to ensure the sustainability of the system.

Based on the analysis presented above, the interrelation between family law, reproductive health, and environmental sustainability can be summarized to provide a clearer overview of the key findings and their legal implications, as shown in the following table.

| Aspect | Key Findings | Legal Implications |
|---|---|---|
| **Family Planning and Legal Obligations** | The utilization of contraceptives, particularly condoms, corresponds with parents' legal obligations under Indonesian family and child protection legislation to safeguard children's welfare, education, and development. | Affirms that responsible family planning constitutes the fulfillment of constitutional and statutory parental responsibilities. |
| **Socioeconomic Impact of Contraceptive Access** | Families having access to contraceptives can more effectively allocate resources, improve economic well-being, and boost the health and educational outcomes of children. | Illustrates that contraceptive utilization upholds the fulfillment of children's rights in accordance with Indonesian legislation. |
| **Environmental Impact of Condom Waste** | Non-biodegradable condom waste exacerbates environmental contamination, presenting a challenge to sustainable development. | Signifies the necessity for legal frameworks to govern condom waste management. |
| **Legal Gap and Policy Need** | Existing Indonesian waste regulations do not particularly address the handling of contraceptive waste. | Proposes the incorporation of the Extended Producer Responsibility (EPR) principle into Indonesia's environmental legal system. |

**Fig. 3.** Summary of Key Findings

## 5 Conclusion

The use of condoms is an important instrument in family planning that has a direct impact on the fulfillment of children's rights and family welfare. However, behind these benefits, condom waste has a significant ecological impact, especially on waters and soil due to its material properties that are difficult to decompose. This condition triggers water pollution, threats to marine species, disturbances of soil structure, and the potential for overall environmental degradation. Unfortunately, until now there is no specific regulation governing the management of waste of disposable contraceptives in the Indonesian environmental law system.

For this reason, a comprehensive policy is needed through the implementation of the Extended Producer Responsibility (EPR) scheme which requires producers to be responsible for the life cycle of their products. In addition to encouraging the use of biodegradable materials, it is necessary to integrate condom waste collection systems, public education

about proper disposal, and strengthen regulations at the national level. This effort is important to balance the need for family protection with ecological responsibility within the framework of sustainable development.

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