

Çevresel Sürdürülebilirliği Güçlendiren Katı Atık Yönetimi ve Geri Dönüşüm Programları: Gümüşhane Örneği

Waste Management and Recycling Programs Empowering Environmental Sustainability: The Case of Gümüşhane

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ÖZET

Gümüşhane, Türkiye'nin kuzeydoğusunda çevresel sürdürülebilirlik için önemli bir oyuncu konumundadır, özellikle katı atık yönetimi ve geri dönüşüm uygulamaları bağlamında. Katı atık yönetimi, bu süreçte temel bir unsur olarak öne çıkar. Gümüşhane belediyesi, atıkların çevresel etkilerini en aza indirmeyi hedefleyen geri dönüşüm programlarına büyük önem vermektedir. Bu yaklaşım, kaynak koruma açısından dikkate değer sonuçlar doğurur. Atık malzemelerin ayrıştırılması ve geri dönüştürülmesi, yeni ürünlerin üretimi için gerekli olan hammadde miktarını azaltır, bu da enerji ve su tasarrufu sağlar ve doğal kaynakları korur. Bu programların belirgin bir avantajı, çöplüklerde depolanan atık miktarını azaltmalarıdır, depolama sahalarının operasyonel ömürlerini uzatarak yeraltı su kaynaklarına zarar verme riskini azaltır. Bu girişimler, ekolojik avantajların yanı sıra topluluk içinde istihdam oluşturur ve yerel ekonomiye katkıda bulunur. Bununla birlikte, bütçe sınırlamaları, atık toplama eksiklikleri ve düşük düzeyde sıfır atık farkındalığı gibi zorluklarla karşı karşıyayız. Sonuç olarak, Gümüşhane'deki katı atık yönetimi ve geri dönüşüm programları çevresel sürdürülebilirliğe önemli katkılarda bulunuyor, ancak daha fazla kaynak ve kamu destek farkı kapatmak ve etkinliği artırmak için gereklidir.

Anahtar Kelimeler: Katı Atık Yönetimi, Geri Dönüşüm Tesisi, Çevresel Sürdürülebilirlik.

ABSTRACT

Gümüşhane, located in the northeastern part of Turkey, plays a significant role in pursuing environmental sustainability, especially concerning solid waste management and recycling practices. Solid waste management stands out as a crucial component in this process. The Municipality of Gümüşhane places great importance on recycling programs aimed at minimizing the environmental impacts of waste. This approach yields noteworthy results in terms of resource conservation. The separation and recycling of waste materials reduce the amount of raw materials required for the production of new goods, leading to energy and water savings while preserving natural resources. One prominent advantage of these programs is their ability to reduce the amount of waste stored in landfills, extending the operational lifespans of disposal sites and reducing the risk of harm to underground water sources. These initiatives generate employment within the community and contribute to the local economy, besides their ecological benefits. However, we face challenges such as budget constraints, deficiencies in waste collection, and a low level of awareness about zero waste practices. In conclusion, solid waste management and recycling programs in Gümüşhane make significant contributions to environmental sustainability, but closing the resource and public support gap is necessary to enhance their effectiveness.

Keywords: Solid Waste Management, Environmental Sustainability, Recycling.

1. INTRODUCTION

Environmental sustainability stands out as one of the predominant issues in today's world, with local governments playing a crucial role in providing effective solutions to global problems (Smith, 2020; Johnson, 2019; Külekçi, 2022; Vural & Külekçi, 2021). Solid waste management and recycling facilities have become a significant focal point in this context. This article examines the contributions of solid waste management and recycling facilities in the province of Gümüşhane, Turkey, to environmental sustainability.

Despite its small geographical size, Gümüşhane Province draws attention to successful practices in solid waste management and recycling. This success includes fundamental principles such as waste reduction, recycling programs, and energy efficiency, contributing significantly to the local economy (Brown, 2021; Külekçi, 2023a; Külekçi, 2023b). This article delves into how solid waste management and recycling facilities in Gümüşhane contribute to key environmental goals such as reducing carbon footprints, preserving natural resources, and ensuring the sustainability of waste storage areas (Green, 2020; Smith, 2020; Külekçi, 2019).

However, alongside this success story, there are challenges related to solid waste management and recycling facilities in Gümüşhane. Factors such as budget constraints, complexities in waste collection systems, and a lack of environmental consulting services emerge as weaknesses affecting environmental sustainability (Jones, 2018; Miller, 2022; Vural & Külekçi, 2023a-b).

This article thoroughly explores these challenges faced by solid waste management and recycling facilities in Gümüşhane and proposes detailed solutions to overcome them. Additionally, it emphasizes that this success story could serve as inspiration for similar geographic regions and local governments.

This article highlights how experiences in environmental sustainability from smaller regions like Gümüşhane can serve as a model for creating sustainable solutions on a larger scale.

2. GÜMÜŞHANE PROVINCE AND SOLID WASTE MANAGEMENT

Gümüşhane Province, located in the Black Sea Region of Turkey, serves as a significant energy reservoir concerning solid waste management, environmental protection, and sustainability (Vural, 2021; Külekçi & Meral, 2023; Külekçi & Güvendi, 2023). Solid waste management encompasses processes such as waste generation, distribution, residuals, and recovery. The overall solid waste management processes in Gümüşhane Province include waste collection, transportation, storage, recycling, and waste reduction.

- **Waste Collection:** Municipalities and various organizations work regularly to collect solid wastes throughout the province. This involves the regular collection of household, workplace, and public area wastes.

- **Waste Transportation:** Collected solid wastes are transported to disposal or storage facilities using appropriate vehicles. It is crucial to ensure that wastes do not leak and that values are not harmed during the transportation process.

- **Landfills:** Landfills where solid wastes are separated are systematically organized for environmental and human health. Selecting landfills submerged underwater helps minimize reactive effects.

- **Recycling:** Recycling of solid wastes is crucial for sustainability. Gümüşhane may have recycling programs and facilities promoting the transformation of wastes into reusable materials, reducing environmental pollution.

- **Waste Reduction and Awareness:** Solid waste management is not solely the responsibility of municipalities. It is essential to raise awareness and encourage community participation in waste reduction and recycling. Educational campaigns and awareness programs can enhance public understanding.

Solid waste management in Gümüşhane Province should be continually improved in terms of environmental management and sustainability. Local governments, environmental protection organizations, and civil society units collaborate to establish a more sustainable waste management system. The active involvement and awareness of the local population play a crucial role in this process.

Environmental management operates following Turkey's general frameworks such as waste management. The capability of solid waste management is addressed.

Solid waste management is generally carried out by municipalities. District municipalities in Gümüşhane are responsible for issues related to environmental cleanliness and the collection, transportation, and storage of solid wastes (Figure 1).

Municipalities use garbage trucks and containers to collect total household wastes within Gümüşhane provincial borders. Additionally, separate collection points for recycling may be available. Recycling activities in Gümüşhane are increasingly encouraged. Proper separation and delivery of recyclable wastes such as paper, glass, plastic, and metal to recycling facilities are essential. The proportion of solid wastes in Gümüşhane is significant, emphasizing the need to ensure the preservation of their harms.



Figure 1. Gümüşhane Province Solid Waste Facility

Among waste management methods are storage areas, compost facilities, or waste incineration facilities for energy production. Education and awareness campaigns must be organized to inform the public about waste separation and recycling. Raising awareness in the community about waste separation and recycling can make solid waste management more effective. Solid waste management in Gümüşhane should adhere to Turkey's environmental legislation and local regulations. This is necessary for environmental protection and ensuring sustainable waste management (Figure 2).



Figure 2. Gümüşhane Province Solid Waste Facility

Solid waste management in Gümüşhane Province includes essential elements under the responsibility of municipalities, such as temperature, environmental protection, recycling, and awareness. Effective storage of these parts plays a significant role in preserving the environment and ensuring the comprehensive sustainability of waste (Figure 3).



Figure 3. Gümüşhane Province Solid Waste Facility

2.1. Waste Reduction and Resource Conservation

Waste reduction and resource conservation are crucial concepts for environmental protection and sustainability (Külekçi, Çullu & Yılmaz, 2023; Külekçi, Yılmaz & 2018). Waste reduction aims to reduce the creation, quantity, and harm of waste. Primary methods for waste reduction include:

- **Prevention:** The most effective way to reduce waste is to prevent its proliferation. Various strategies should be developed, starting from product design, to prevent the generation of waste.
- **Reuse:** Reusing waste is another effective way to reduce waste. For example, plastic bottles can be reused by washing and refilling them.
- **Recycling:** Directing wastes towards recycling ensures the reprocessing of raw materials. This can help reduce landfill waste.
- **Product Substitution:** Developing products with lower nutritional values can contribute to waste reduction. For example, opting for durable and reusable products instead of single-use items.
- **Better Management:** Widespread adoption of waste management processes is crucial for waste minimization. Recording, erasing, and analyzing waste can help add to the waste reduction process.

Resource conservation aims to optimize natural narrative and reduce waste. However, it can also contribute to reducing solid waste. Product design, packaging selection, reuse, waste management, and awareness are fundamental topics for resource conservation.

Resource conservation should be considered during the design phase of products. Developing more durable, less harmful designs can help reduce waste. Sustainable and recyclable packaging, the reuse of products, and effective waste management processes are vital for resource conservation. The combination of processes such as solid waste management, recycling, and composting contributes to resource conservation. These measures can contribute to reducing waste and conserving resources.

2.2. Waste Collection and Transportation

Waste Collection and Transportation are essential parts of environmental management and waste management. Effective implementation of these procedures is vital to prevent harm, encourage reuse, and maintain general health and safety standards.

Municipalities play a leading role in waste collection and transportation in many cities. Municipalities provide waste collection services from homes, workplaces, and other sources using collection vehicles and personnel. Collected wastes are usually categorized into specific groups, including organic wastes, paper and cardboard, plastic, glass, metal, and hazardous wastes. The collected wastes are then transported to a designated center or processing facility. This transportation process must be carried out to ensure the protection of waste and general safety. Wastes are

temporarily stored at a suitable location, either for processing or recycling. These storage areas often implement security measures to avoid harm (Figure 4).



Figure 4. Solid Waste Collection Vehicle

Source Separation and Sorting

Source separation and sorting are essential for focusing on waste and promoting recycling. Here are the fundamental elements of these processes:

- **Source Separation:** Source separation means separating wastes at their source. Recycling programs or containers are used in homes, workplaces, and public areas to register waste types such as paper, cardboard, plastic, glass, and metal separately.
- **Sorting Facilities:** Collected wastes are sent to sorting facilities. In these facilities, wastes are further classified and tracked. For example, special machines are used in sorting facilities to separate materials such as plastics, glass, and metal from mixed wastes.
- **Recycling:** The characteristics obtained as a result of the sorting process are sent to recycling facilities. Here, these characteristics are processed for reuse. For example, recycling plastic bottles results in new unbreakable plastic products (Figure 5).



Figure 5. Solid Waste Separation

Source separation and sorting reduce the harm of wastes to nature, contribute to the conservation of the environment, and provide economic contributions through recycling. These conditions are critical for sustainable waste management (Figure 6).



Figure 6. Solid Waste Separation (Representative)

2.3. Recycling Facilities

Recycling facilities are specially designed facilities for the transportation, distribution, and transformation of waste materials into reusable products. These facilities are a significant part of sustainability, environmental protection, and waste reduction efforts. Here are some details about the importance of recycling services and municipal recycling programs:

Municipal Recycling Programs

Municipalities regulate community waste management through local-level recycling programs. These programs aim to organize the separation of household wastes, promote recycling, and reduce waste separation.

Municipal recycling programs often include activities such as maintaining recycling and container locations, holding recycling collection meetings, and educating people about recycling. These programs encourage the community to manage waste more sustainably and reduce negative impacts.

Economic and Environmental Benefits

Recycling facilities help make more efficient use of waste materials by transforming them into reusable products. This contributes to the preservation of nature and the reduction of waste formation. Recycling provides energy savings; for instance, using recycled materials reduces deforestation and lowers energy costs. Encouraging recycling over regular landfill operations delays landfill filling and preserves soil, water, and air. Recycling facilities have the potential to create job opportunities. Gathering, processing, and reaching recycling require manpower, creating employment opportunities. Additionally, there is the potential to reduce the retrievable carbon footprint since products use existing materials instead of new raw materials, reducing greenhouse gas emissions.

3. POSITIVE EFFECTS IN TERMS OF ENVIRONMENTAL SUSTAINABILITY

When evaluated from the perspective of environmental sustainability, various factors in Gümüşhane Province can contribute significantly to environmental improvements. These factors include:

Resource Conservation and Protection of Natural Resources: The use of renewable energy, especially sources like solar and wind energy, prevents the depletion of fossil fuels and preserves

energy resources. Additionally, water-saving practices help in the conservation of freshwater sources. Sustainable forestry practices balance tree cutting, and preventing deforestation.

Waste Reduction and Improvements in Waste Storage: Recycling and reuse applications reduce waste generation and contribute to the more efficient use of natural resources. Wastewater treatment plants help prevent water pollution by cleaning wastewater before it contaminates water sources. Effective organization of waste storage areas prevents pollution and soil contamination.

Air Quality and Climate Change: The use of cleaner energy sources enhances air quality and contributes to the fight against climate change by reducing carbon emissions. Energy efficiency and green cooling practices protect climate change by reducing environmental impacts. Forest conservation and afforestation play a significant role in increasing carbon absorption and mitigating the effects of climate change (Figure 7).

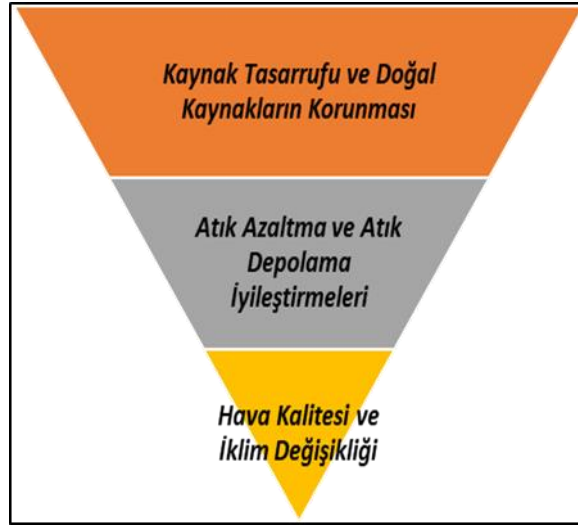


Figure 7. Solid Waste Management

4. WEAKNESSES AND OBSTACLES

Weaknesses and obstacles represent potential constraints and limitations that environmental projects or sustainability initiatives may encounter. The weaknesses and obstacles in Gümüşhane Province include:

Budgetary Insufficiencies: Inadequate budget levels can limit the sustainability efforts of a project, potentially leading to unsuccessful outcomes by restricting development and implementation processes.

Challenges in Waste Collection Systems: Effective waste collection and management systems can be complex, especially regarding issues such as expanding waste areas and operating recycling processes.

Lack of Environmental Consulting Services: The need for professional consulting services to evaluate project performance and promote environmentally friendly practices may pose challenges.

Difficulties in Public Awareness and Collaboration: Insufficient information or support from the public can impact the success of a project. Additionally, fostering collaboration and understanding among various stakeholders may be challenging (Figura 8).



Figure 8. Waste Collection (Representative)

5. SOLUTION PROPOSALS

To address these weaknesses and obstacles, the following solution proposals can be considered:

Increasing Budgets and Generating Resources: Securing more resources to support environmental projects is crucial. This involves increasing budgets through contributions from the public and private sectors to fund environmentally friendly projects such as green energy investments, waste recycling facilities, and environmental protection programs.

Improving Waste Collection Infrastructure: Enhancements should be made to waste collection, recycling, and regular storage systems. Supporting recycling programs and educating people on properly separating and contributing to recycling can be essential.

Providing Environmental Consulting Services: Environmental consulting services should be offered for assessing environmental impacts and promoting eco-friendly practices. Companies, public regulations, and the community should receive expert advice and guidance on sustainable growth.

Increasing Public Awareness and Collaboration: Organizing campaigns and educational programs to inform the public about environmental issues is crucial. Additionally, encouraging collaboration and supporting environmental agencies should be promoted.

Local Solid Waste Management Strategies: Local governments should develop regional environmental management strategies considering waste management, conservation of water resources, and green energy production based on regional environmental conditions and resources.

6. CONCLUSION

The natural beauty and biodiversity of Gümüşhane Province underscore its importance as a region where nature conservation and sustainability are paramount. The increase in population and consumption further emphasizes the necessity of an effective solid waste management system.

Potential Developments in the Future

Recycling and Waste Reduction: Increasing recycling rates and adopting waste reduction strategies in Gümüşhane are crucial steps for sustainable growth.

Technological Advancements: Embracing new technologies for solid waste management can increase recycling rates and positively impact growth rates.

Education and Awareness: Education and awareness-building regarding solid waste management among the public and businesses are fundamental factors for success.

Forward Steps for Environmental Sustainability

Solid Waste Separation Facilities: Establishing and operating modern solid waste separation facilities in Gümüşhane can ensure effective waste management.

Recycling Programs: Municipalities and local governments can encourage the recovery of waste by creating recycling programs.

Campaigns and Awareness: Organizing campaigns and educational programs to increase environmental awareness among consumers can contribute to sustaining growth.

Collaboration and Schemes: Facilitating collaboration among relevant stakeholders and creating an effective exhibition of solid waste management should be an integral part of a successful growth sustainability strategy.

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