Green FORCE

Policy Brief # 2
September 2023

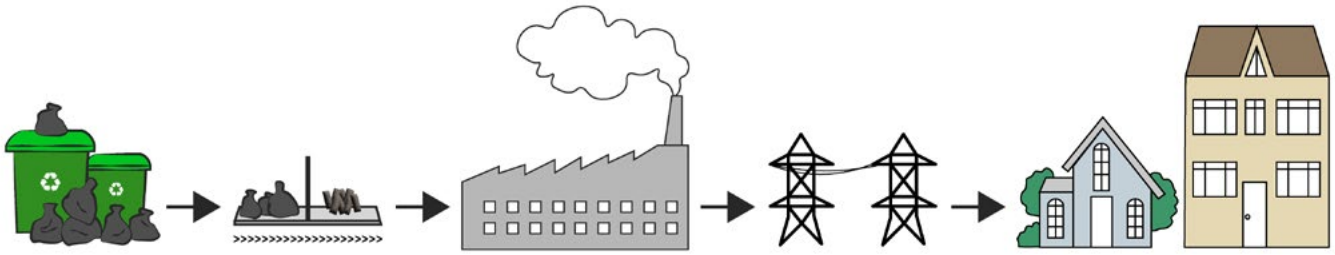
WASTE TO ENERGY

UNLOCKING THE POTENTIAL OF WASTE AS AN ALTERNATIVE SOURCE OF ENERGY IN THE WESTERN BALKANS

Throughout the Western Balkans, waste is still considered an externality since vast quantities of waste are being deposited in open dump sites or even in nature, awaiting natural decomposition, uncontrolled incineration, or even being washed toward shores and contributing to marine litter. A substantial portion of these waste streams conceals untapped energy potential. Harnessing the latent energy potential residing within waste materials represents a huge opportunity that can contribute towards the Circular Economy vision of the sector. Such byproducts from waste recovery processes could generate income, supporting sector upgrades with EU Standards and supplying the industry with an alternative fuel directly contributing to the ambitious CO_2 emission reduction. Finally, such practice addresses other detrimental effects of waste disposal (particularly landfilling and incineration) on the environment and human health. Producing alternative fuels via a waste-to-energy framework can contribute to diversifying the energy mix (especially in industrial processes), reducing overreliance on conventional fossil fuels and fostering energy security. By embracing the potential of 'waste-to-energy', WB countries embark on a transformative journey towards a more sustainable and resilient future, where resourcefulness and environmental responsibility intersect to address some of our most pressing global challenges. This endeavour demands concerted efforts from public authorities and industries to shift from a linear to a circular economy for a low-carbon future.

Key concepts:

Waste-to-Energy	is a broad term identifying the value chain aimed at exploiting the energy potential of waste for heat and/or electricity production.
Circular Economy	a model of production and consumption, which involves sharing, leasing, reusing, repairing, refurbishing and recycling existing materials and products as long as possible.
Refuse-Derived Fuel (RDF)	considered an alternative energy source deriving from the thermal recovery process of domestic and business waste, including biodegradable material, plastics, cardboard, etc.
Solid Recovered Fuel (SRF)	is a high-quality alternative to fossil fuel produced mainly from commercial waste, wood, textiles, and plastic. It is widely used in cement kilns to replace fossil fuels. The difference with RDF lies in the refinement level required to meet end-user specifications.

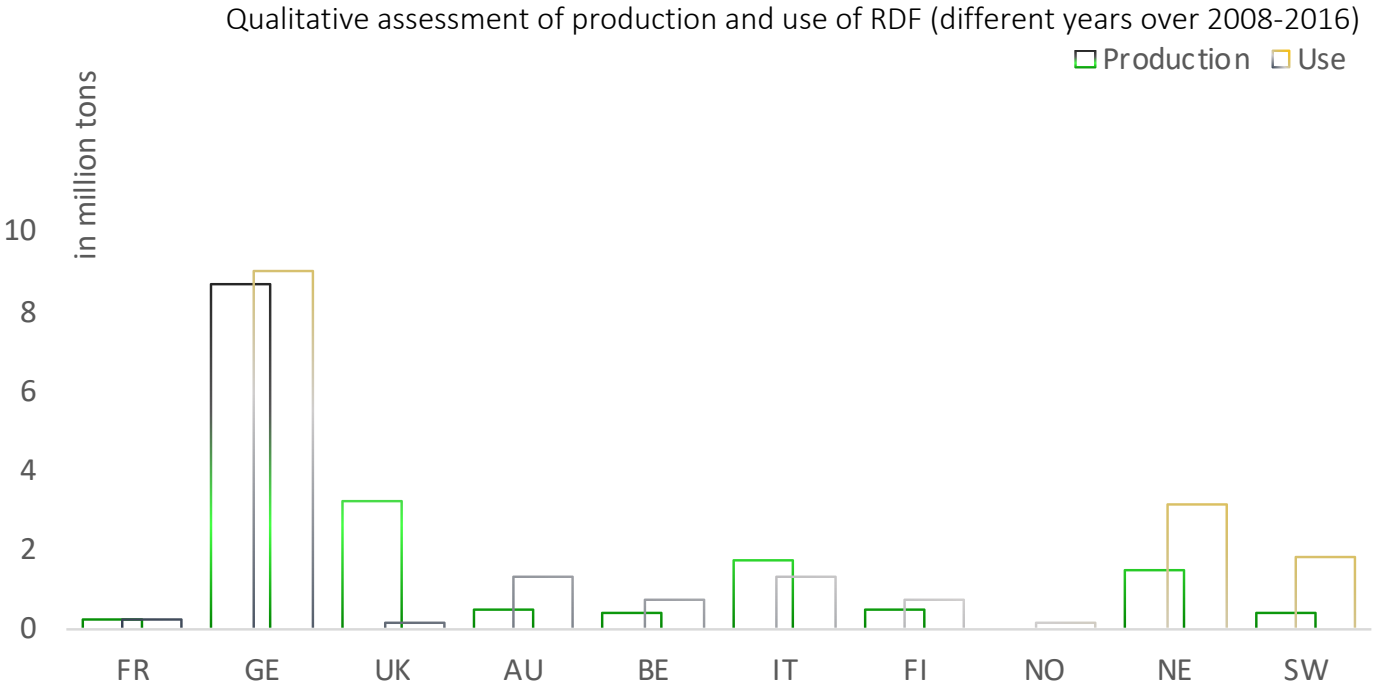


Alternative fuels - the international practice

Refuse-Derived Fuel (RDF) and Solid Recovered Fuel (SRF), deriving from defined waste streams, have emerged as promising energy alternatives for power generation since the 1990s. The primary objective of this practice is to reduce the amount of waste that ends up in landfills or gets incinerated and prevent inadequate waste management practices while reaping the economic benefits embedded in waste (waste as a resource). However, as long as waste remains a reality, the most effective approach is to extend the life cycle of resources by repurposing them through reuse and recycling and supporting recovery with energy generation as a last resort.

The relentless march of economic development, population growth and unrestrained consumption patterns have given rise to an alarming surge in waste production. In addition to the environmental concerns, materials are being dumped even though they embody calorific power that can be reutilised for power generation. Since the mid-90s, several EU countries have embraced technologies for energy recovery from municipal solid waste, making it the current state-of-the-art method. For example, England reduced by 50% the amount of municipal waste landfilled during the last decade and exported about 2.6 million tons of RDF only in 2019. At the same time, replacing fossil fuels with alternative fuels can significantly reduce carbon emissions. For instance, the Austrian–German cement industry replaced fossil-fuels with RDF/SRF by 80% and reduced the sector's carbon emissions by 17%.

Alternative fuels, however, come with a cost, as their chemical composure embeds pollutants such as chlorine, sulphur, and heavy metals. The mixture of pollutants poses risks, which could be more harmful than classic fossil fuels such as coke, lignite, coal, and other derivates. Risks are exacerbated in countries that have not fully implemented the 2010/75/EU "Industrial Emissions Directive" (IED). In this context, WB countries must align their national frameworks to EID and the Best Available Techniques (BAT) before fully harnessing the socio-economic and environmental benefits of RDF/SRF co-processing.

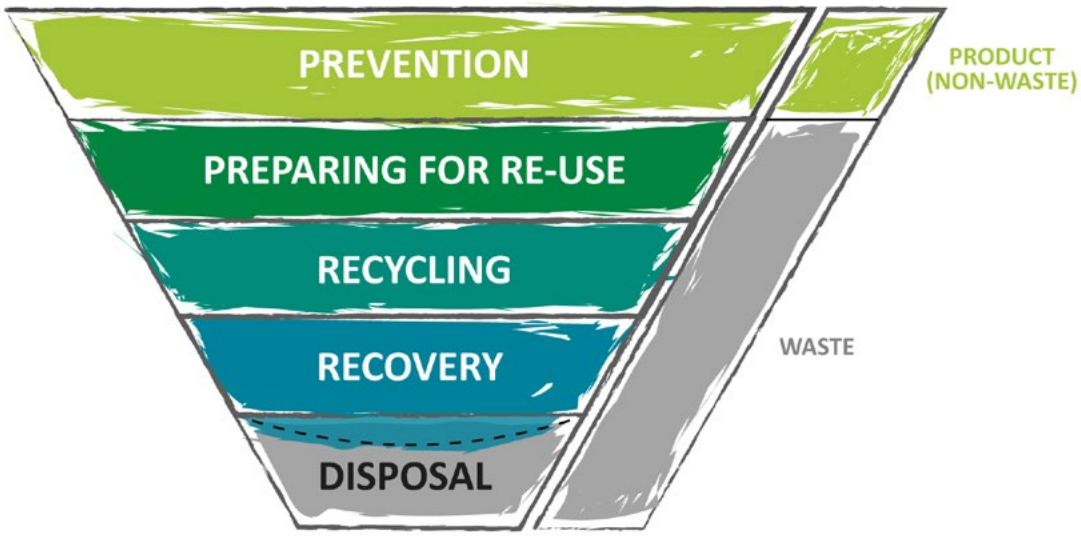


Source of data: Trends in the use of solid recovered fuels - IEA Bioenergy

Status Quo in the Western Balkans

Municipal waste management is a real challenge in the Western Balkan (WB) from a regulatory and capacities point of view. WB countries are, arguably, *"lost in transition"*, with large quantities of waste ending up in (un)sanitary landfills and, to a large extent, in informal dump sites. The relatively low cost of landfilling combined with inadequate enforcement of the regulatory framework due to the lack of appropriate human resource capacities and a lack of efforts into structural solutions for waste management poses essential environmental and health challenges for WB countries. In addition, there is persistent inertia in implementing the waste management hierarchy[1], where disposal should be the last option for waste treatment. The short-cut from bin to disposal and a *not-in-my-backyard syndrome* lead to adding pressure from the community and long-term soil, air and water contamination (leakage of lixiviates, toxins and greenhouse gas emissions (GHG)). Meanwhile, finite resources like land are consumed, and valuable materials and energy resources are lost (or locked).

[1] as provided by the national legislative framework and in line with the EU Directive 2008/98/EC



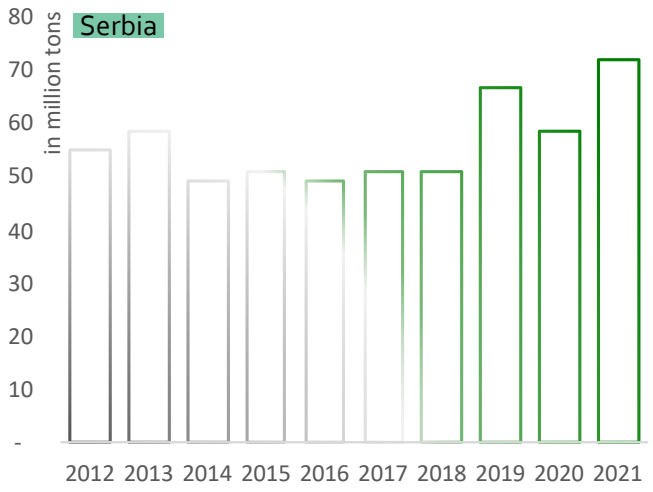
A number of societal issues are also of key concern regarding waste management in the WBs, from health impacts to the working conditions and livelihood of those working with waste sorting. In Albania alone, it is estimated that between 355 and 500 Romani and Egyptian families were actively engaged in informal waste segregation of glass, metal, plastic, and paper during 2012-2018. These communities' livelihoods depended on this informal activity. Recycling companies benefited significantly from it until the waste management service was re-organised by most of the municipalities, and they were cut out (without any option for integration and provision of the service formally). Since then, the recycling rate in Albania has declined from 18% to 5%.

WB countries have made substantial commitments to curtail their GHG emissions by 2030 and promote a sustainable future for their citizens and the planet. Albania, in particular, has vowed to reduce its emissions by an impressive 20.9% compared to the business-as-usual scenario by the end of 2030. North Macedonia has set a highly ambitious target, pledging to decrease its greenhouse gas emissions by a staggering 82% by 2030 compared to 1990. Meanwhile, Serbia has also made a notable commitment, aiming to reduce its emissions by 33.3% by 2030 compared to 1990. These commitments strongly signal these countries' intentions to tackle the climate crisis and achieve their goals. Yet, intentions need to be translated into actions.

The potential of alternative fuels in the WB

The existing issues of waste management in the WBs and commitments to curtailing GHG emissions are compelling reasons to seek and explore sustainable waste recovery strategies. These strategies not only divert non-recycled waste from landfills but also convert it into a valuable energy resource, giving value to the waste and expanding the range of fuels available for thermal industrial processes beyond what's achievable through incineration's heat recovery. Concurrently, a dynamic shift is underway in the industrial sector towards the energy-from-waste approach, particularly emphasising its implementation in the cement industry. Related businesses in WB have voiced their inclination to replace a significant portion, up to 25%, of their current fossil fuel usage with alternative sources such as RDF/SRF. This transition is primarily motivated by cost efficiency (savings in operating costs from fossil fuels) and the imperative to curb GHG emissions. The latter contributes to mitigating industries' carbon footprint and transitioning into more sustainable production processes.

Data shows that over the last five years, large quantities of waste were disposed of,



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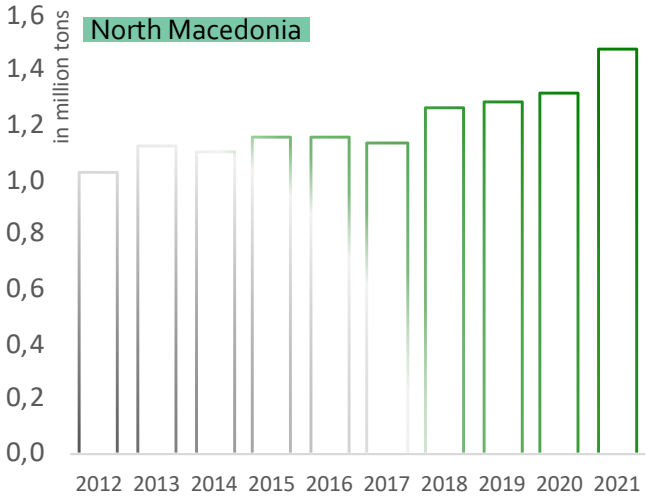

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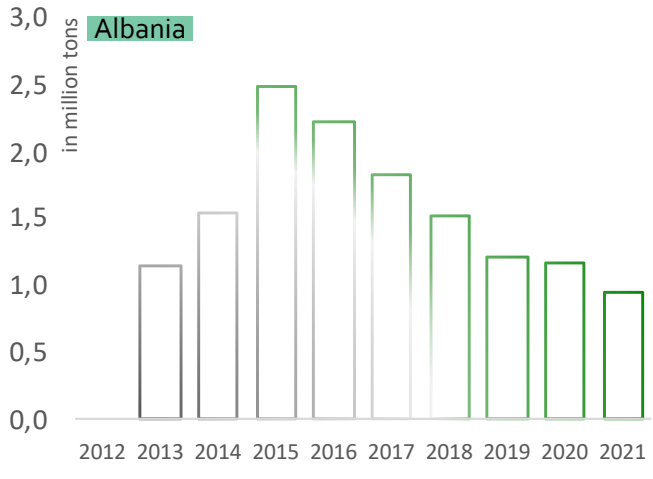

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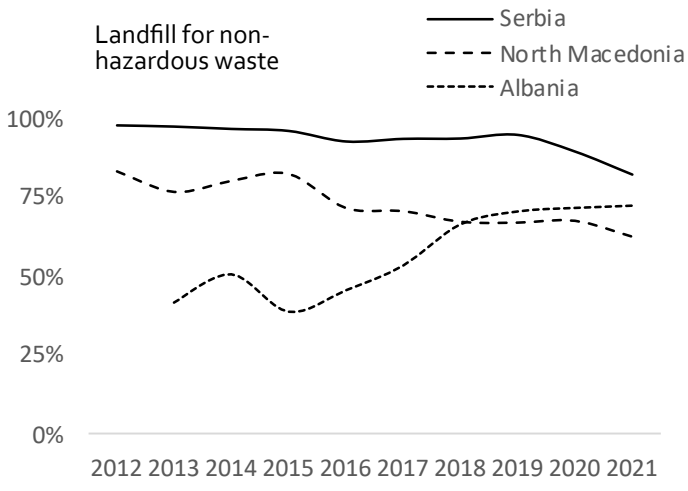

averaging about 91% in Serbia, 67% in North Macedonia, and 67% in Albania (see Figure 2). To assess the potential of the energy-to-waste approach, a thorough market research and feasibility study were carried out in 2021 across WB countries, including Albania's North region, Serbia's Duboko region, and North Macedonia's Skopje region in 2021. Findings suggest that adopting the energy from the waste approach could reduce landfilled waste by ~11-17%, add to the existing supply of alternative fuels by ~37,154 tons per year, and reduce CO_2 emissions by about 37,154 tons annually.

Recommendations

The commitments made with the Paris Agreement on climate change, New Urban Agenda, and Sustainable Development Goals (SDG 11, 12) represent a major challenge requiring a collective effort from decision-makers, businesses, and society. Yet, changing the mindset from waste to resource – and using the economic potential of waste can bring huge opportunities for improving the quality of the service, generating jobs, creating ground for adequate integration of marginalized groups, improving public hygiene as well as directly contributing to social awareness about consumerism and sustainability.

We provide a list of recommendations with some hints on enabling this process in the best possible way.

- **Develop expertise and capabilities in the public and private sectors to design and adopt alternative business models with public-private-community participation (shared benefits business models).** In this approach, communities are well-informed, engaged, and committed to sharing the costs and benefits of any adopted solution. Engaging local communities (residents and businesses) in shared benefits business models can change their behaviors to waste management policies and practices, facilitating a gradual shift from disposal-oriented (linear) to value-creation (circular) approaches.
- **Channel funds on waste management and treatment infrastructure** to increase service standards, territorial coverage, and segregation in order to increase recycling, reusing and recovery.
- **Introduce RDF/SFR production as an alternative that might generate twofold benefits for local communities.** On the one side, the environmental benefits of reducing quantities of waste stocked in landfills and/or incinerated progress towards a circular economy. On the other side, the economic benefits related to economically viable business models, new jobs created locally and potential alleviation of poverty for disadvantaged societal groups (such as the Roma community).
- **Ensure compliance with internationally recognized standards for effective waste recovery and co-processing of RDF/SRF producers and users.** In this direction, aligning the national to the EU regulatory framework presents an opportunity for WBs to access international markets for alternative fuels.
- **Strongly coordinate efforts in waste management with local authorities,** from strategic planning to updates to the regulatory framework. Then, proceed to introduce, adapt, and implement waste management plans and practices on a practical level, involving local communities and private actors.
- **Implement the waste management hierarchy effectively to advance sustainable waste management practices.** Both public and private stakeholders must take coordinated actions that prioritize waste reduction at its source, promote reuse and recycling, and increase maximum recovery capacities.
- **Raise awareness and increase transparency by engaging communities on waste management issues.** An essential ingredient for the success of waste management initiatives is the dissemination of information, transparency in processes, and the fostering of public engagement and awareness (on negative and positive aspects). These initiatives gain invaluable momentum by ensuring that citizens are well-informed and can actively participate in decision-making processes.

ABOUT THIS POLICY BRIEF

This policy brief was developed by GreenFORCE, a Horizon Europe project which aims at fostering excellence in the "Western Balkans' green transition" and scientific research capacities of Co-PLAN, Institute for Habitat Development (Albania), Center for Economic Analysis (North Macedonia), and University of Belgrade, Faculty of Geography (Serbia). In twinship with Nordregio - Nordic Institute for Regional Development and Planning - (Sweden) and Politecnico di Torino (Italy), these organisations work closely to produce territorial knowledge through exploratory research and institutional learning.

The policy brief and recommendations build on previous research conducted by Co-PLAN on Waste to Energy in the Cement Industry for the Western Balkans and further discussion amongst researchers from the GreenFORCE consortium partnership.

Funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or European Research Executive Agency (REA). Neither the European Union nor the granting authority can be held responsible for them.

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Graphics by Merita Toska and Klesta Galanxhi

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