

# Sustainable Management Of Construction & Demolition Waste In Romania, Swot And Pest Analyses

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**Abstract** The goal of this article is to set the framework towards a strategic planning process for Romania's sustainable management of construction and demolition waste (CDW). Considering the goal set by the EU of 70% minimum rate of CDW preparation for reuse and recycling, strategic objectives and tactics, should be established. By conducting the SWOT (strengths, weaknesses, opportunities, and threats) and PEST (political, economic, social, technological) analyses, we present the context in which the main regulation on CDW in Romania, OG 92/2021, was promulgated and the situation over one year after it went into effect. The findings capture the areas where Romania has the most progress to make - feasibility, scalability, monitoring, market competitiveness and economic and political support. The main opportunities and strengths are represented by the existing regulation, the free EU market, and the accessible technologies.

**Keywords** – construction demolition waste, strategic management, sustainability, waste management

## I. INTRODUCTION

The transition to the sustainable management of construction and demolition waste (CDW) is a requirement imposed on Romania by membership of the European Union, the UN and the COP (United Nations Climate Change Conference). Despite a lack of awareness in some areas and slow progress, this requirement is urgent and failure to comply can have costly consequences.

The call is part of a wider initiative to fit into the circular economy, "where the value of products and materials is maintained as much as possible; waste and resource use are minimized; and when a product reaches the end of its life, it is used again to create additional value." [1]

Waste is "any substance or object which the holder discards or intends or is required to discard", according to Law 211/2011 on the waste regime republished and OG 92/2021. [2] At least 70% of the waste must be ready for reuse, recycling, recovery, including backfilling. According to Romanian legislation, the obligation for these operations lies with the permit holders, while the authorities, including those implementing extended producer responsibility, have a duty to regulate and ensure the continuity of the organization of waste collection. In terms of preferences, the waste hierarchy is: prevention, preparing for re-use, recycling, other recovery operations (such as energy) and disposal. The objective is to transform as much waste as possible into by-products, resulting from processes that lead to a definite further use of the product/material. [3]

Thus, it is necessary to create a new industry, using raw materials, processes, and products, to address an existing market while maintaining the profitability of such a model. The authority is also obliged to consider, and by implication know, the "best available technologies" (OG92/2021, Art. 13 (6) b)), which should be considered as best, in relation to the context. This is one of the arguments for carrying out such an analysis.

The research methodology used in this article is document analysis and the application of SWOT (strengths, weaknesses, opportunities, and threats) and PEST (political, economic, social and technological) strategic analyses.

This article has the following structure: in the first section we show the current state of Romania in terms of the 5 stages of progressive growth proposed by Mihai [4], then we will carry out SWOT and PEST analyses. Finally, we will analyze the results and present the conclusions. Further studies are needed to create a compliant strategy.

The circular economy is the type of economy that maintains the value of products and materials as much as possible, while reducing the resources used, by creating new life cycles for products that can no longer be used as such.

Waste is an object or substance that is destined to be discarded, voluntarily or compulsorily.

Mihai [4] lists some of the causes of construction and demolition (C&D) waste: poor design by architects and planners, a procurement process that does not focus on these issues, lack of good materials management, waste of raw materials and unexpected changes in design or design. [4]

Currently, landfills are the main way of waste management in Romania, but it is necessary to urgently change to better solutions for reduction, reuse and recycling, in order to align with EU legislation, reiterated in Emergency Ordinance 92 of 19.08.2021. [5].

The transition from the current main way of managing C&D waste in Romania to the EU target of preparing 70% of C&D waste for reuse and recycling follows five progressive stages of growth, according to Mihai. [4]

1. Dumping waste in landfills or on roadsides, rivers, and forests, which is the state of most small and medium-sized Romanian municipalities today,
2. Disposal of waste in specially designated sites, starting from improperly designated sites, with the improved option of disposal in specially designated sites for C&D waste,
3. Treatment and reuse of waste in civil construction - in road and building foundations, as backfill, as cover material for landfill of household waste, for house building in rural areas and on-site recovery.
4. Regional integrated waste management system - where there are facilities for storage, crushing (mobile and fixed) and separation (metal, plastic, wood, etc.).
5. Creation of building materials - cements, recycled aggregates, new building materials, recycling companies, etc.

In Romania, Stages 1-3 are best represented, with Stage 4 requiring an integrated regional waste management system, which is still under development in the Romanian regions.

This step is necessary to produce new materials, which is why it is understood that the isolated production of a few viable solutions is not sufficient to reach the targeted level. Sustained and cost-effective production is necessary, for which a predictable and constant flow of raw material can be ensured, generating a new commercial and product life cycle. [4] The circular economy is the type of economy that maintains the value of products and materials as much as possible, while reducing the resources used, by creating new life cycles for products that can no longer be used as such. Waste is an object or substance that is destined to be discarded, voluntarily or compulsorily. Mihai [4] lists some of the causes of construction and demolition (C&D) waste: poor design by architects and planners, a procurement process that does not focus on these issues, lack of good materials management, waste of raw materials and unexpected changes in design or design. [4]

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### *Stage I*

Stage I is present in most localities, where building materials are abandoned in urban areas and on the outskirts of localities. The main reasons for this are: lack of control by the authorities and lack of special places for such activities. Thus, strict control of these activities and the provision of appropriate waste disposal methods could trigger the interest and involvement of waste producers.

In Romania, however, there is insufficient data on the existence of landfills and illegal waste dumping practices, which is a major impediment to taking any functional measures.

### *Stage II*

In Constanta, the C&D waste generated has been stored in a special site since 2008. Gurau et. al (cited by [4]) showed that only 15,220t of C&D waste was collected there in 2008, out of an estimated 122,250t generated in 2008 (in the South-East region). In 2009, only 2006t of the estimated 6,850t generated was collected.

The study compares the quantities of waste collected, as reported mainly by collection companies, with the proportion of C&D waste as calculated on a per capita average per capita basis. Thus, at the 2014 level, the amount declared by waste collectors was 519,723.36 t, and the actual amount generated according to the calculations is 2,925,333.88 t. Thus, there is a difference of almost 6 times between the amount generated and the amount collected, which was probably illegally dumped or used in other ways. [4]

This comparison reveals the insufficient waste monitoring taking place in Romania and why waste management policies cannot be properly evaluated.

### *Stage III*

The main methods of C&D waste recovery are backfilling, for which mainly non-toxic solid waste such as sand, concrete, brick, etc., which may or may not have been crushed, is used. Specially designated sites for the disposal of C&D waste have also started to appear, but these are not yet sufficiently well demarcated to ensure the purity of the collected waste.

In 2019, 31 processing facilities have been identified, which have the capacity to process 3 million tonnes of waste per year and are managed by private operators. Pilot projects to develop their own public waste crushing facilities exist in Buzău, Mediaş and Dej, but there are still counties without such facilities. [4]

The rest of the paper is organized as follows. The methodology and the analyses SWOT and PEST are elaborated in section II. The findings are discussed in section III. Concluding remarks are given in section IV.

## II. METHODOLOGY – SWOT AND PEST ANALYSES

Most areas in Romania are in Stage I, with only a few areas qualifying for Stages II and III, which means that the majority of the population dumps C&D waste in unmanaged sites and landfills, waste generators should be provided with both functional waste disposal routes that are in line with the principles of the circular economy and economic incentives and disincentives for desirable and undesirable behavior.

The lack of functional mechanisms for these operations causes the proliferation of such practices, where C&D waste is dumped alongside household, agricultural and other waste. This is particularly the case in areas on the outskirts of cities, due to the expansion of the population and also due to the segregation taking place in certain communities, which pushes the poorest and most deprived inhabitants to the outskirts, where they do not have the means to ensure minimum conditions for a civilized life (e.g. the Pata Rât area in Cluj-Napoca or the outskirts of Baia Mare, where there are settlements of Roma).

Romania is not the only EU country where these challenges exist, as Poland faces illegal landfills due to the high costs of collecting and transporting C&D waste and also of mixing it with household waste.

In order to see what the reasons are for the stage Romania is in, we will carry out SWOT (strengths, weaknesses, opportunities and threats and challenges) and PEST (political and administrative, economic, social and technical) analysis on C&D waste management from a circular economy perspective in Romania.

#### *A. Strengths*

a) The existence of an informal economy of recycling and reuse, through on-site recovery of materials (wood, iron). There are also traditionally people who collect and transport ferrous materials for recycling in an informal but constant way.

b) The existence of a legislative requirement that a waste management plan must be drawn up to obtain planning permission (OG 92/2021).

c) The option of carrying out an initial audit of the existing building to be demolished and constructed, collecting data on the existing materials, recording in detail the quantities, dimensions and stages, for a planned demolition and construction with a high chance of recovering the materials (OG92/2021).

d) The option of carrying out selective demolition, which ensures the best chances of waste recovery, through the orderly removal of: hazardous substances, provided for by law as such, materials that are easiest to remove (e.g. furniture) and structural elements, at which stage the material streams are separated (e.g. window frames, pipes, etc.).

#### *A. Weaknesses*

a) The lack of effective systems for separating demolished and used materials, leading to mixing of construction and demolition waste (C&D) with municipal solid waste (MSW).

b) Lack of information to builders, designers and engineers on C&D waste management, with there being a general preconception that it would increase the cost of operations too much. [6]

c) "Lack of cost-effective techniques for demolition and selective removal of complex materials." (INCD URBAN-INCERC, 2019) For example, several case studies show that the presence of gypsum plaster in the aggregate prevents its reuse to achieve high strength, while its selection is time and labor consuming. It is also necessary to remove insulation materials such as polyurethane foam, which is likely to be present in larger quantities in demolition projects and has a similar effect.

d) Variable criteria: Mechanical properties, aesthetics, reparability, reconditionability and reusability in the collected form are elements that are not always favorable to the reuse and recycling process.

e) Lack of budgets for qualified staff to do a waste management plan and or demolition audit.

c) Lack of data, since waste management companies are not obliged to provide standardized data on quantities collected and there are differences in how waste data is collected. [8]

d) Lack of cross-disciplinary approach to the subject, so that not all relevant points of view for successful implementation are considered. This is visible through the fact that the legal basis for C&D waste management, has been provided through an Emergency Ordinance (OG 92/2021), thus not leaving much room for consultations.

e) Lack of monitoring of progress and publicity of results, and lack of accountability for failures, visible through the fact that there are no reports regarding the performances achieved since the previous waste management laws were promulgated (e.g. Law 211/15.11.2011).

f) Lack of traceability and transparency in the area of waste reuse and recycling, due to lack of data.

#### *B. Opportunities*

a) The existence of a legal basis in Romania and strict laws on C&D waste management, aligned with EU and UN policy (OG 92/2021).

b) The existence of funds allocated for the transition to the green economy and of monitoring and advisory bodies in this field. [9]

c) The existence of best practices, experimented in different countries and cities, which can be taken and adapted to the Romanian national and regional environment, some of which are provided by the EU C&D Waste Protocol. [10]

d) The existence of a National Waste Management Strategy in Romania. . [11]

e) The free movement of the market in the EU is a positive element, due to the possibility of Romania being a good exporter of recycled materials and aggregates, patents and new technologies, which will be received with interest by other countries. For example, in Finland, there is a functional industrial symbiosis and companies actively purchase waste. [12]

f) The existence of an international market for good quality recycled aggregates. Better exploitation of higher strength aggregates, such as high strength concrete, could increase the competitiveness of the recycled aggregates market and quality differentiation at recycling companies. This will also increase end-user acceptance of these practices and change standards and perceptions. For instance, in Holland, a country with a 95% CDW recycling rate, 78% of recycled concrete was used in 2015 for road foundation. . [13, p. 3]

g) The requirement to monitor waste streams to assess and promote progress in the implementation of legislative measures such as the National Strategy for Sustainable Development 2030, the revised Framework Directive of 2008 and GC 92 of 2021.

h) Procurement of mobile and fixed (public and private) facilities for mechanical treatment of C&D waste. [14]

i) The emergence of "green design" and "eco-architects" who create products that are as sustainable as possible, easy to reuse or repair, remanufacture or reintegrate. [15]

### C. Threats

a) Low landfill fees and high rate of landfilling waste, [16]

b) Lack of a market for reused and recycled materials,

c) Lack of integration of the informal ("black") recycling market into the formal market,

d) Lack of a guide to implementing the legislation, e.g. the most recent directive OG 92/2021.

e) Lack of centralization of data to analyze the evolution of waste management and compare it with other countries or with previous years. These data must be collected in the same way, at European standards, because for example, statistics on waste generated that include excavated soil cannot be compared with statistics that exclude this category.

f) Preconception of the unprofitable ratio between the costs involved in the selective management of C&D waste, i.e., labor, storage and transport costs and the positive value resulting from the fractions produced (the opinion that sustainability is a luxury). [17]

g) The need to improve the recovery and logistics routes required for fractions such as thermal insulation materials, gypsum, etc.

h) Lack of collaborative platforms to facilitate information dissemination, increase acceptance and education on the subject, integrate informal "recyclers", and integrate scientific advances into the market as quickly as possible.

i) Lack of an integrative approach to C&D waste management, thus legislation requires actions that are not currently economically, socially, or financially feasible (e.g., requirement for local authorities to provide a recycling system, while over 1/3 of counties do not yet have such facilities.) [14]

j) Lack of a step-by-step process that all areas of society can keep up with. Thus, there is a risk of creating a new bureaucratic layer, for example in the permitting process, where a standard waste management plan format is copied for permitting without taking into account the specific conditions on the ground.

k) Lack of integrated dialogue on the subject of C&D waste management, taking into account all the stakeholders.

l) Lack of more interest and responsibility for waste on the part of construction material producers.

m) The high price of building materials and the way public procurement is carried out, which disproportionately favors the "cheapest" criterion over more innovative, sustainable, intelligent solutions, according to acquisition Law 98/2016, Art. 187, (8). [18]

n) Lack of concomitant conditions for the implementation of waste management plans: existence of infrastructure, a market and proximity, cost-effectiveness of the sustainable waste management process and acceptance by civil society.

*D. PEST – Political*

a) From a political and administrative point of view, the premises for a feasible and efficient operation to achieve sustainable C&D waste management exist in Romania, through the Waste Management Strategy and the legislation in force, but they are too limited to formalism and too little integrated.

b) There is a lack of sufficient representation of sustainable development interests at the level of the state leadership in terms of construction waste management.

c) The administration has a duty to legislate to achieve realistic knowledge of the quantities of waste produced, the generators of waste and the processes leading to its creation, as well as its routes and destination. In the absence of reliable data at this stage, the information is mainly speculative, and it is not possible to organize precise interventions on the route of each waste building material. It is only by knowing the route of each product that interventions in technology or their recovery can be carried out through an intermediate link, on a large scale and not just in small, isolated cases.

d) Having established the route of each material that can be produced, it is the duty of the administration to establish ways of disposing of or returning to nature waste that cannot be avoided.

e) There is not a guide for the implementation of Government Ordinance 92 of 19.08.2021, which is the fundamental text on C&D waste management in Romania. The creation of this guide is delayed, more than 1 year after the approval of the law.

f) Public procurement in the field of civil and road construction is not regulated in such a way as to incorporate requirements related to reuse and recycling, environmental protection, EU environmental policies and prioritization of innovative technical solutions. For example, priority could be given to bidders who provide a certain proportion of reused and recycled materials.

g) Also from a political point of view, there is the problem of the lobby of the large construction material producing companies, which are able to advance their interests and are not sufficiently motivated to comply with the rigors of C&D waste management from the point of view of the circular economy, as long as - according to the legislation in force - the penalties are mainly directed towards the permit holder, although according to the OG 92 of 2021 there is the possibility of proposing measures and recommendations directed also towards producers.

h) Political reasons can prevent valuable forms of cooperation.

*E. PEST – Economical*

a) Economic viability and consumer acceptance are weak points in the progress of sustainable C&D waste management. Although the necessary legislative framework and technical solutions exist, only good analysis proving economic profitability can stimulate competitive practice of these methods and technologies. For example, the addition of stabilizers (slag, cement, etc.) can make materials viable in terms of mechanical performance, but the supply is too costly to purchase large quantities, with disproportionate impact.

b) Keeping costs down through equal or greater durability with 'new' products. Solutions must be sufficiently sustainable that energy consumption for production, and the likelihood of needing replacement over time, do not increase costs.

c) Competitive success is also ensured by similar long-term performance with new materials or alternatives on the market. At present, these elements are not sufficiently well covered for economic exchange to be cost-effective and widely accepted

*F. PEST – Social*

a) The acceptance of civil society is important to obtain. In Romania, it exists only at a formal level, as the population continues to discard CDW in nature and other places.

b) Romania is also a market in which there are many products whose only advantage is that they are cheap, and consumers are not used to accepting a higher cost for long-term value. [19]

c) In Romania, the reputation of reused and recycled - "second-hand" - products is probably inferior, and the lack of proper quality certification leads to suspicions about the product on offer.

d) The Romanian consumer's mentality is conservative and does not have a high tolerance for risks, innovations and experiments, preferring to have them successfully implemented by someone else or to have the opportunity to get to know them better before taking a risk. [20]

### PEST – Tehnological

a) There are many technological solutions available for purchase, for the recycling of CDW, for example in the field of concrete recycling, which is the newer one, compared to glass, iron, wood. [21]

b) According to INCD URBAN-INCERC, in terms of waste assessment for recovery in different applications, the following environmental requirements are found: "Analysis of physicochemical characteristics of pollutant potential and integration into media, determination of hazardous substance content, particle size composition, behavior in wetting-drying, freezing-thawing cycles, determination of total organic carbon (TOC) content, neutralization capacity, determination of Sulphur content, acid generation potential, leaching in water and acidic media." [7, p. 7]

c) Innovators in the technical environment need to take these cumulatively into account to deliver solutions that meet today's requirements.

## III. ANALYSIS OF FINDINGS AND DISCUSSION

### *SWOT Discussion*

There are many strengths and opportunities that are fundamental to a successful transition to sustainable C&D waste management, including - externally, EU regulations and support, best practices and markets in more advanced countries, and - internally, existing legislation and the existence of an informal market for recycling and reuse of construction materials (concrete, glass, wood, iron). Important progress has been made, such as the National C&D Waste Management Strategy and the installation of more than 31 C&D waste processing plants, as well as the planning of new plants in counties where they are missing.

On the other hand, there are also weaknesses and challenges, the most important being the tendency towards formalism in the Romanian bureaucracy, i.e. to comply with certain rules only on paper, without taking into account their feasibility on the ground, and the lack of consultation processes and acceptance by civil society, which is still largely the victim of misinformation and preconceptions. For example, many teaching and research operations are carried out in educational institutions only at a theoretical level, with little practical implementation and use, although their role is to provide the basis for sustainable development in society.

Also, in the absence of a genuine cross-disciplinary approach, the solutions identified always lack something - either feasibility, scalability, monitoring, market competitiveness or the economic and political support they need. In addition, the basic feature of the Romanian market and of the public procurement process is the preference for what is cheapest, a criterion that is difficult for innovative green solutions to meet, as they are based on environmental and circularity criteria.

In fact, the circular economy has borrowed many of the principles of ecology, and this cannot be separated from the economic view of things. The definition of ecology is the science of environmental conservation and regeneration, based on the following principles:

1. "all is connected to all" - i.e. the environment is important to all related environments.
2. "everything must lead somewhere" - there must be no waste in nature, due to the indestructibility of matter.
3. "nature knows best" - because man takes from nature what he cannot create himself, nature must also be protected.
4. "the polluter pays" - because nothing comes for free. (Mihai, 2019)

To integrate these principles of ecology into the economic, development and business environment, where the principles are different and have much to do with profitability, income and expenditure, a change of mentality is needed, involving all members of society.

This profound change must involve all sectors of society: political, economic, social and technical.

### *G. PEST Discussion*

The transition to circular economy waste management involves the proportional participation of all sectors of society, from the smallest decisions to the largest. Looking at the 4 Romanian sectors: political, economic, social and technical, the forces that motivate them and the objectives that drive them are different. For the political and administrative environment, it is a question of finding a balance between foreign policy, i.e. adapting to the rules transmitted by the EU, the UN, etc., and domestic policy, based on democratic mechanisms, representing the will of

the majority. However, this pillar is not sufficient to achieve change at the desired pace, both because of internal obstacles - such as lobbying by big business, the interests and opposition of other parties, changes of government - and because of the lack of vital elements: an educated, involved, committed civil society and a free market.

The economic environment is geared towards profit and growth. This is the way the global economy operates at the moment in the capitalist system. From this point of view, the transition must pass the test of commercial viability, which is dependent on the existence of demand, supply, and money flow. Profitability calculations are normal, even more so as Romania is a market that prefers discounts and the cheapest things from consumers to the public procurement process. This is where the administration has a say.

Firstly, charging for solutions that are meant to be discouraged is a way of encouraging alternatives. Then, there is the possibility of rebates for individuals and companies that have made progress in C&D waste management, so that they pay less for sanitation. Thirdly, the market for recycled materials can be boosted by producing a public procurement guide that favors these products and putting them into operation, then successfully disseminating the results. As a major consumer, the State can support the production of certain materials by prioritizing criteria other than the lowest price.

From a social point of view, it is not enough to say that "people don't want" to recycle, for example, but ways must be found for genuine consultation to see what they want or how they can be helped to see the advantages of a different way of looking at things. This process needs to be rooted in education, with schools and universities being the main promoters of a different way of looking at things, but one that is achievable outside the school environment. If every individual took their social responsibility seriously, which should be taught in school, then everyone would function well in connection with each other, which would lead to a well-functioning system in general. This is the great responsibility that educational institutions bear, and they thus carry the future in their hands.

The turning point is for innovative solutions to be accepted and even preferred by end consumers, without taking advantage of them by setting prices too high, making the circular economy a 'luxury' product. In fact, it should be explained to people that the prices they are used to are based on the fact that most products are not local, so that other populations bear the price difference through the work they do for extremely low amounts, and that the price is artificial because that is the price of the product, made locally. But the state should get involved by distributing the money collected on the one hand - for example through fines for polluters - to subsidize good choices.

Expectations are very high from the technical sector, because it is also the one that consistently produces the best results. Science and research are at the forefront of this change. Without them, progress cannot be made. The quality criteria for materials are known, but they need to be formalized in standards and certifications, for as many materials as possible, at as many levels as possible.

It is not enough for the technical environment to focus on commissioning or on compliance with global standards - ISO and energy standards, which place little emphasis on the waste chapter, because their role is not to support the C&D waste market. Research centers must focus on producing standards that are promoted and certifications that are credible, so that those who manage to perform in this area can distinguish themselves and can be advanced with the help of the other 3 pillars, up to commercialization and wide consumption.

Inter-disciplinarity is vital in this area, to achieve digitization - for the accurate and continuous collection of data on which to build progress - and green economy dialogue, led by eco-designers, eco-architects, eco-engineers, who know their fields very well and can open up important conversations with colleagues in other disciplines and especially the private sector.

The best results are achieved where government, academia, civil society, industry and research work together pragmatically on solutions to localized problems.

The first step is to identify and compare innovative materials and technologies for building materials according to the principles of the circular economy (reuse, recycling).



#### IV. CONCLUSIONS

During this study we aimed to study the current state of C&D waste management in Romania from a circular economy point of view, both through inter-disciplinary SWOT and PEST analyses and through the identification and comparison of innovative materials and technologies to produce construction materials according to circular economy principles of reusing and recycling.

Our study did not cover the reduction phase, which is quite complex and mainly concerns the work of architects and design engineers. Our point of view is geared towards work on the site, where it is easiest to intervene through the engineering field.

First, we listed the five progressive steps for Romania to meet the standard already adopted in legislation by GC 92/2021, of 70% readiness for reuse and recycling. We found that at present, most C&D waste is disposed of in inappropriate places and there is insufficient data on these operations, while most recycling and reuse takes place informally, in an uncoordinated way.

The key point is the fourth step, where integrated regional waste management plans and strategies emerge. From there, one can discuss the existence of a circuit in which all parties find their place.

Next, we have analyzed Romania's status in terms of pluses and minuses, to see what the strongest and weakest points are, in order to make well thought-out and effective interventions.

We noted that there are many strengths and opportunities, the most important of which are the existence of national and international support for the ongoing transition, as well as funds allocated for these changes. Also, the importance of the waste collection phase on the site highlights the opportunity for everyone to make a difference in this area.

However, there is no shortage of weaknesses, the strongest of which are the lack of guidelines for the implementation of GC 92/2021, "green" public procurement, and integrated efforts to bring together the efforts being made in this area. A roadmap for the implementation of GC 92/2021 would be necessary to know the way forward.

In other words, more work needs to be done together to counter the influence of influential and well-established business habits and patterns, which are also maintained by the consumer mentality specific to our country. For example, the preference for the cheapest products at the expense of all other criteria is harmful when trying to promote a different style of consumption.

These strengths and weaknesses are felt and require action from the main pillars of society. Firstly, the political and administrative pillar, although it has many beneficial initiatives underway, such as the Waste Management Strategy, needs to provide much more integrative and motivating solutions and set a good example by changing the procurement process towards these goals.

Secondly, the economic pillar needs to have its say, but not without the help of economic measures provided by the State to encourage and discourage certain behaviors. The economic mentality also needs to change, so that sustainable development is no longer considered optional, and the only type of development is that which is consumerist and abusive to man and nature.

Pilot operations are needed to show how much waste can be reused and recycled and how much could be saved. In this way, sustainable resource management would also have a place in private environments that are not fundamentally environmentally oriented.

Thirdly, the social pillar is absolutely necessary, because it is civil society that needs to change its consumption habits. Acceptance of new solutions is possible, through specific mechanisms and, above all, through dialogue with the green economy.

Fourthly, the technical pillar is seen as the key pillar, and perhaps too much pressure is often put on it, because in the absence of the other three, it remains powerless to bring about large-scale change.

From a technical point of view, there are fixed and mobile crushing, screening and separation plants, which allow this recycled material to be put to good use on a large scale. For example, in Belgium almost 100% of recycled aggregates are recovered. Road and foundation construction is well suited to this recycled aggregate, and it is therefore timely to develop the most suitable recipes and technologies for processing it.

Glass is also an accepted material for recycling. There are opportunities to combine recycled glass with recycled aggregates and produce bricks, as well as many other processes, recipes and uses.

Wood and iron have been well known and used for recycling since ancient times, but nowadays most of this takes place on the informal market in Romania, through people who collect and sell them to companies that process these materials.

The existence of transparent routes for materials, as well as certifications of their origin and quality, could give more impetus and prestige to the recycling market, as without them the risks for a business in this field are too high. Moreover, an efficiency analysis needs to be carried out on any material made from recycled or reused materials compared to new material. This must follow the entire product and all its component parts, both from an economic and environmental point of view and from a technical point of view, in order to identify points of intervention and to be able to make precise adjustments.

The main source of ideas for reduction (saving resources), reuse and recycling is knowledge of the entire technological process, so that innovative solutions can be found along the entire production chain, both for the new product and for the re-use of 'waste' materials.

Throughout the entire technological process, yield should be continuously increased. If something is lost during the technological process, it should be further processed into a by-product of the highest possible quality. This is where the environmental and economic advantages should be combined.

Studying the materials that go into the products is very important in order to map all the transformations of the raw materials and create the phase diagram. This has long been used for polymers to find new solutions in the manufacturing process.

A 'Sustainability Charter' in the construction sector would be welcome, taking equal account of economic performance, environmental responsibility and social solidarity, bearing in mind that this is a growing field. In this way, many small and large measures can accumulate to point the way to sustainability, to achieve the perception that sustainability means quality.

In conclusion, we note that Romania has taken important steps and has the fundamentals it needs for a successful transition to sustainable C&D waste management, but needs to balance surface interventions with integrated ones, well connected to existing systems, in close consultation with civil society. Otherwise, all these good elements may not come together and progress may be too slow, which would certainly lead to increased costs and repercussions both now and in the future.

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