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Review Paper

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STREAMLINING CONSTRUCTION: MAXIMIZING EFFICIENCY THROUGH EFFECTIVE WASTE MANAGEMENT: THEORETICAL REVIEW

РАЦИОНАЛИЗАЦИЈА ИЗГРАДЊЕ: МАКСИМИЗИРАЊЕ ЕФИКАСНОСТИ КРОЗ ЕФИКАСНО УПРАВЉАЊЕ ОТПАДОМ: ТЕОРИЈСКИ ПРЕГЛЕД

Summery: *The construction boom in Albania after the '90s had a significant impact on the country's economy. It brought about rapid urbanization, job creation, and increased investment opportunities. The construction sector became a major contributor to GDP growth, attracting both domestic and foreign investments. It also stimulated demand for various industries, such as manufacturing and services, leading to overall economic development. With increased construction activities, there was a rise in construction waste generation. This highlighted the need for effective waste management practices to minimize environmental impact.Waste management is a crucial aspect of construction projects, yet it hasn't received as much emphasis as in other industries. This paper aims to highlight the importance of waste management in construction and the need for effective strategies to minimize waste.In the construction industry, waste refers to any material, energy, or time that is not utilized efficiently and adds no value to the project. Construction waste can include excess materials, unused resources, inefficient processes, and environmental damage. The presence of waste in construction not only leads to financial losses but also has negative environmental and social impacts. This paper presents a review on studies that have systematically investigated the occurrence of waste in the construction industry, including concepts adopted, metrics, and type of feedback provided relating to efficiency improvement.*
Keywords: *Construction, Environmental accounting, Sustainable development, Waste management*
JEL Classification: *Q53, Q56*

Резиме: Грађевински бум у Албанији после 90-их имао је значајан утицај на економију земље. То је донело брзу урбанизацију, отварање нових радних места и повећане могућности улагања. Грађевински сектор је постао главни фактор раста БДП-а, привлачећи и домаће и стране инвестиције. Такође је стимулисала потражњу за разним индустријама, као што су производња и услуге, што је довело до укупног економског развоја. Са повећањем грађевинских активности дошло је до пораста производње грађевинског отпада. Ово је нагласило потребу за ефикасним праксама управљања отпадом како би се минимизирао утицај на животну средину. Управљање отпадом је кључни аспект грађевинских пројеката, али није добио толики нагласак као у другим индустријама. Овај рад има за циљ да истакне значај управљања отпадом у грађевинарству и потребу за ефикасним стратегијама за смањење отпада. У грађевинској индустрији, отпад се односи на било који материјал, енергију или време који се не користи ефикасно и не додаје вредност пројекту. Грађевински отпад може укључивати вишак материјала, неискоришћене ресурсе, неефикасне процесе и штету по животну средину. Присуство отпада у грађевинарству не само да доводи до финансијских губитака већ има и негативне еколошке и друштвене утицаје. Овај рад представља преглед студија које су систематски истраживале појаву отпада у грађевинској индустрији, укључујући усвојене концепте, метрику и врсту повратних информација које се односе на побољшање ефикасности.
Кључне ријечи: грађевинарство, еколошко рачуноводство, одрживи развој, управљање отпадом
ЈЕЛ класификација: *Q53, Q56*

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INTRODUCTION

Waste management is a crucial aspect of any industry, including construction. When it comes to construction companies, effective waste management is essential for various reasons. It not only helps in reducing environmental impact but also contributes to cost savings and regulatory compliance. Construction projects generate a significant amount of waste, including materials, debris, and hazardous substances. Proper waste management practices ensure that these wastes are handled, treated, and disposed of responsibly and sustainably. By implementing efficient waste management strategies, construction companies can minimize their ecological footprint and promote a cleaner and healthier environment for everyone.

One of the key benefits of effective waste management in construction is the reduction of environmental impact. Construction activities can have a significant impact on land, air, and water quality. By implementing waste management practices such as recycling, reusing, and proper disposal, construction companies can minimize the amount of waste that ends up in landfills or gets released into the environment. This helps in conserving natural resources, reducing pollution, and preserving ecosystems.

In addition to environmental benefits, proper waste management can also result in cost savings for construction companies. By implementing recycling programs and reusing materials, companies can reduce their procurement costs. Instead of purchasing new materials, they can utilize recycled or reclaimed materials, which are often more cost-effective. Moreover, by properly managing hazardous waste, construction companies can avoid potential fines and penalties associated with non-compliance with environmental regulations.

Efficient waste management also plays a crucial role in ensuring the health and safety of workers and the general public. Construction sites can be hazardous environments, and improper waste management can increase the risk of accidents, injuries, and exposure to harmful substances. By implementing proper waste handling and disposal procedures, construction companies can minimize these risks and create a safer working environment for their employees. This includes providing appropriate training and personal protective equipment to workers involved in waste management activities.

1. PROBLEM DEFINITION

The generation of construction waste has been identified as a major problem due to its direct impacts on the environment as well as the efficiency of the construction industry.

In Albania, the main objective of environmental statistics is the production of user-understandable statistics, standardized according to the normative acts of the EU and suitable for use in the design of policies and the management of activities with environmental impact on a national and wider scale. The data collected are air quality (SO2, NO2, O3, LGS, PM10, CO, Pb), data on GHG and other emissions into the atmosphere, data on land management in contaminated areas (hot spots), data on solid urban and inert waste, pesticides imported and used in agriculture, the general water balance in Albania, data on river waters, data on lake waters, data on bacteriological water pollution of the seas on the beaches of Albania, etc.

In 2022, in Albania, it turns out that around 820,322 thousand tons of urban waste has been managed. The annual amount of urban waste managed per inhabitant, on a national scale, in 2022, is 295 kg/per inhabitant, from 311 kg/per inhabitant in the previous year.

In 2022, the amount of non-urban waste managed together with urban waste is 11.6% compared to of the total amount, from 13.8% that was in 2021, marking a decrease of 2.2%.

In 2022, about 76.6% of the total amount of waste was deposited in landfills and waste fields, while in 2021, 79% were deposited, marking a decrease of about 2.4% of the total amount of landfills and waste fields approved as temporary deposits by municipalities relevant.

In 2022, 18.9% of the total amount of waste was recycled, while last year this indicator was 18.8%. In 2022, they were treated by burning in an incinerator for elimination and energy purposes about 4.4% of the total amount of waste, thus marking an increase in this indicator by 2.4%, compared with the same indicator in 2021.

However, facts and situations have shown that this is not the best way of managing waste, the main producer of which turns out to be construction.

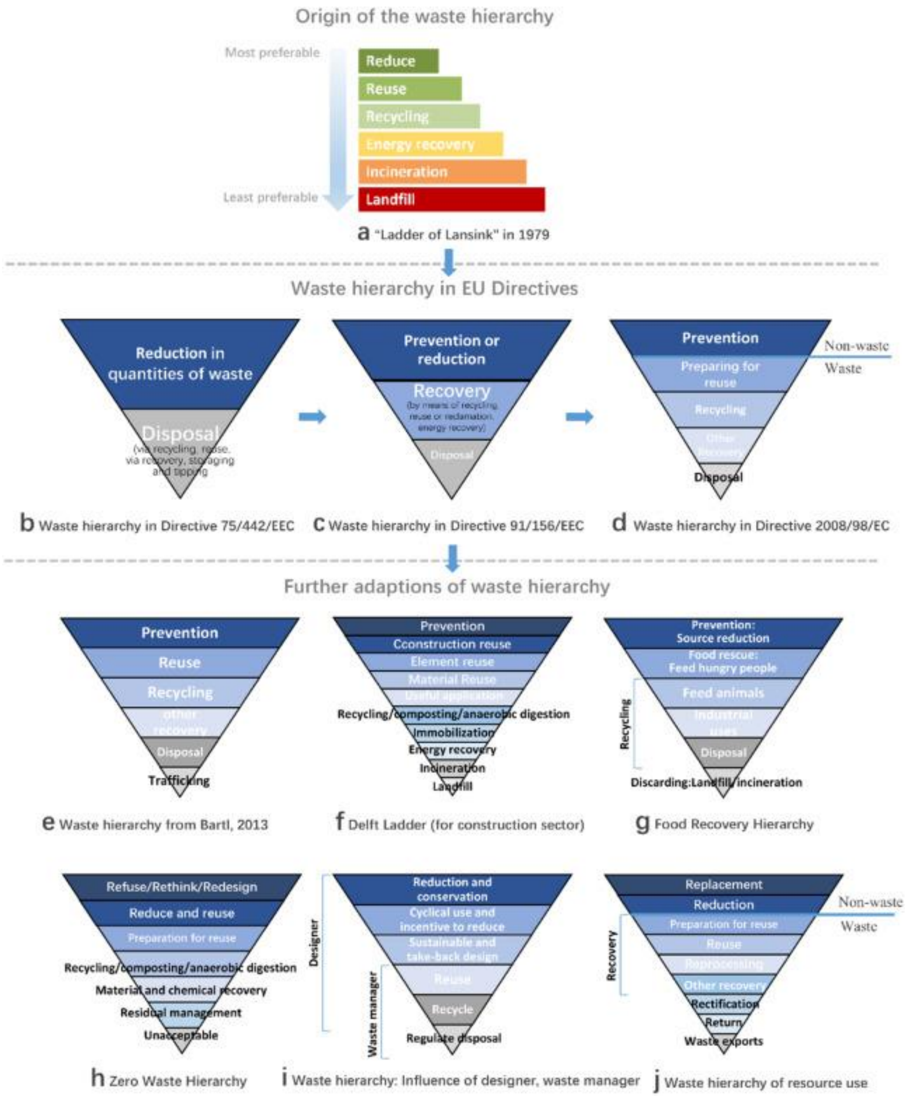
The challenge in waste management, in a universal way, but especially for a country in constant change, requires the development of critical thinking and handling in financial terms, through accounting waste management methods.

2. PRACTICES OF WASTE MANAGEMENT WORLDWIDE

Different countries, and different economic and not only, adapt different methods of waste management. China, the United States (US), and the European Union (EU) as the three largest economies are considered as well as the three main generators of Construction and demolition waste. Studies show that the circular economy shares a similar evolutionary trajectory as the waste hierarchy. Both the waste hierarchy and the circular economy envisage a new way of managing waste by rethinking, redesigning, and reusing products to improve resource effectiveness and reduce the generation and negative impact of waste from the life cycle of pre-use, use, and post-use stages.

The European Union is mainly focused on drafting and implementing laws, regulations, and conventions that directly direct waste management.

Fig. 2. Development of waste hierarchy in Europe.



Source:

Panel a was depicted based on the ladder of Lansink (Recycling.com 2019); Panel b is designed based on the Directive 75/442/EEC (EC, 1975); Panel c was plotted based on the Directive 91/156/EEC (EC, 1991); Panel d was pictured based on the Directive 2008/98/EC (EC 2008); Panel e is derived from Bartl (2013); Panel f is from Hendricks and Te Dordthorst (2001); Panel g is from the US Environmental Protection Agency's Food Recovery Hierarchy (Ceryes et al. 2021); Panel h was redesigned based on Zero Waste Hierarchy (2019); Panel i is from Cole et al. (2019); Panel j is a "hierarchy of resource use" proposed by Gharfalkar et al. (2015) (Zhang et al. 2022).

Apart from the EU, other countries such as China, Japan, the USA, Korea, and Vietnam also took the 3Rs and prioritized the "reduce" option as the essential principle for waste management policymaking (Sakai et al. 2011).

Studies on the effectiveness of waste management methods have been done in China, as one of the countries with very high levels of impact. In particular, four cities, including Beijing, Shenzhen, Xi'an and Changsha, were examined as cases in the analysis . It was found that (1) more attention should be given to construction waste management in all cities, as approximately 44% of all cities do not have their own regulations; (2) the focus of these policies shift from the end of the construction waste chain to the beginning of the construction waste management chain, and then to the whole chain; (3) financial and technological instruments could greatly improve performance; and (4) new technologies and instruments could facilitate communications between stakeholders to improve construction waste performance.

In the United States, waste management focuses on three elements, waste reduction, recycling, and reuse as essential to sustainable resource management. Most of the construction and demolition waste currently generated in the US is legally destined for landfills regulated under Code of Federal Regulations (CFR) 40, subtitles D and C. In some areas all or a part of the construction and demolition waste stream is illegally deposited on land, or in natural drainages including water, in violation of regulations for the protection of human health, commerce and the environment. US businesses and citizens legally dispose of millions of tons of building-related waste in solid waste landfills each year.

In Australia, the findings reveal twenty-six critical solutions for waste management.

From the exploratory factor analysis, five solution factors for waste management were derived. These factors were: team building and supervision; strategic guidelines in waste management; proper design and documentation; innovation in waste management decisions; and life cycle management. Evidence suggests that both technologies and attitudes require improvement to eliminate/minimize waste generation in construction projects.

3. ENVIRONMENTAL MANAGEMENT ACCOUNTING AND LIFECYCLE ASSESSMENT FOR CONSTRUCTION PROJECTS

Constructing a building and using it for many years produces long-lasting impacts on human health and the environment. Waste is produced in different types and quantities throughout the life-cycle of a building with the bulk of the waste being produced during the C&D phases (Yeheyis et al. 2012). Life cycle assessment (LCA) is the rapidly evolving science of illuminating these impacts in terms of their quality, severity, and duration. A building generates environmental impacts throughout its life cycle. The various stages of a typical life cycle as defined in LCA are: the production and construction stages, the use stage: the end-of-life stage, and externalized impacts beyond the system boundary (Kotaji et al. 2003).

Life Cycle Assesssment (LSA) of buildings is defined as comparative analysis tool which is used to evaluate environmental hazards and consumption of resources associated with the product, process or the activity over the entire life of the product (Sharma et al. 2011).

Within the laste decade research on LCA has gained attention increasing considerably from manufacturing of building materials and construction processes (Abd Rashid and Yusoff 2015).

On the other hand, Environmental management accounting (EMA) can be integrated with life cycle waste management to enhance sustainability and efficiency in construction practices. EMA focuses on the identification, measurement, and management of environmental costs and impacts within an organization. EMA can be integrated with life cycle waste management:

- Cost Analysis: EMA can help in analyzing the costs associated with waste management throughout the construction life cycle. This includes costs of waste generation, segregation, collection, disposal, and recycling. By understanding the financial implications, companies can make informed decisions to minimize waste and associated costs.
- Performance Monitoring: EMA provides tools and techniques to monitor and track environmental performance indicators related to waste management. This allows companies to assess their progress, identify areas for improvement, and set targets for waste reduction and recycling.
- Decision-making: EMA provides valuable information for decision-making processes. By integrating EMA with life cycle waste management, companies can evaluate the environmental and financial consequences of different waste management strategies. This

enables them to make more sustainable choices, such as selecting materials with lower waste generation potential or opting for recycling options.

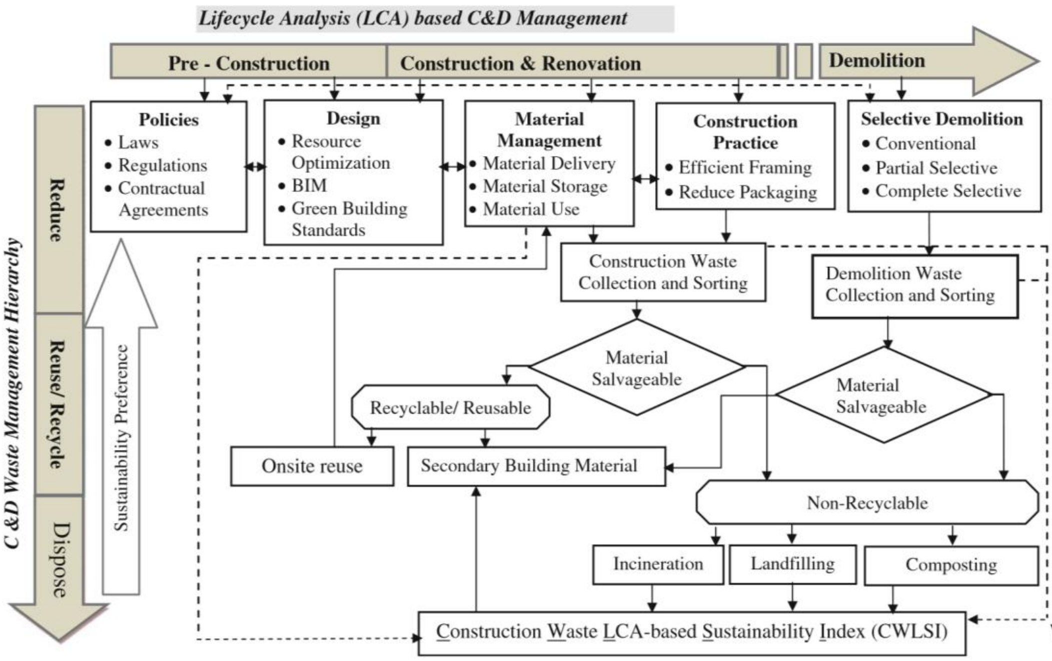
- Reporting and Accountability: EMA facilitates the reporting of environmental data and performance metrics related to waste management. This helps companies demonstrate their commitment to sustainability, comply with regulations, and engage stakeholders in their waste reduction efforts.

By integrating EMA with life cycle waste management, construction companies can effectively manage and reduce waste while considering the environmental and financial aspects. It promotes a holistic approach to sustainability in construction practices.

Following in the footsteps of traditional LCA product evaluation applications, several studies have focused on the environmental evaluation of building materials. The objective of such research efforts is to enable selection of environmentally preferred materials and products by identifying sources of the most significant environmental impacts (Cabeza et al. 2014).

We referred to these studies, based also in the framework in Fig. 2, to extract the main areas where the evaluation of the situation in the construction industry will begin.

Fig.2 Conceptual framework for lifecycle-based integrated C&D waste management system



Source: Yeheyis et al. 2012

The basic points, where the evaluation of the state of waste management in the construction industry consists on the following areas:

Apply lean principles
Proper selection of materials
Develop the market for recycled products
Consider environmental aspects in design and tendering stages
Understand attitudes and behaviours towards WM
Change people's attitudes and encourage industry
Onsite management systems
Proper planning of construction activities
Assign implementation responsibility for WM to designated people
Adequate supervision
Training and education
Simplification of design
Financial rewards and incentives and enhance of communication
Regular meetings

Lifecycle costing
Transparency in reporting
Sense of collective responsibility
Promoting prefabrication methods
Relationship building among stakeholders
Implementation and enforcement of policies and regulations
Increase landfill charges
Adoption of transparent environmental reporting

Each of the items above will be translated in a more detailed information, in order that the assessment can be clear to the respondents and gain much more detailed and fair information.

These areas will be used in preparing a questionnaire that will be targeted to construction companies, public authorities relating to constriction permits, environmental institutions and financial accountants within the scope of identifying which is the situation, weaknesses and strengths if any, and integrate the environmental indicators along with economic indicators, generated from EMA.

CONCLUSIONS

Buildings play major role in energy consumption of the total available energy. In the estate sector, whether residential or commercial, the energy is consumed at a high rate and hence contributes a lot in the consumption of fossil fuels and emission of various hazardous gases which leads to global harms like ODP, greenhouse effect acidification etc.

There are many different alternatives for building construction if they could be implemented during the construction phase of a building. This review of the problem on Albanian context comes from the rapid growth of the industry during these 25 years, and its impact in the economy takes an important part. Not only economic, but also environmental impact should be considered at this level.

Through this study we attempt to investigate areas and indicators, on how to implement waste management strategies during life cycle assessment of construction projects and translate these strategies into key indicators that will be further used for performance evaluation on environmental Accounting context.

REFERENCES

Abd Rashid, A. F., & Yusoff, S. (2015). A review of life cycle assessment method for building industry. Renewable and Sustainable Energy Reviews, 45, 244–248. https://doi.org/10.1016/j.rser.2015.01.043

Bartl, Andreas. 2014. "Ways and Entanglements of the Waste Hierarchy." *Waste Management* 34 (1): 1–2.

Cabeza, L. F., Rincón, L., Vilariño, V., Pérez, G., & Castell, A. (2014). Life cycle assessment (LCA) and life cycle energy analysis (LCEA) of buildings and the building sector: A review. Renewable and Sustainable Energy Reviews, 29, 394–416. https://doi.org/10.1016/j.rser.2013.08.037

Ceryes, Caitlin A., Cassandra C. Antonacci, Susan A. Harvey, Margo L. Spiker, Arielle Bickers, and Roni A. Neff. 2021. "Maybe It's Still Good? A Qualitative Study of Factors Influencing Food Waste and Application of the EPA Food Recovery Hierarchy in US Supermarkets." *Appetite* 161: 105111. https://doi.org/10.1016/j.appet.2021.105111.

Cole, Chris, Anthony Gnanapragasam, Tim Cooper, and Jagdeep Singh. 2019. "An Assessment of Achievements of the WEEE Directive in Promoting Movement Up the Waste Hierarchy: Experiences in the UK." *Waste Management* 87: 417–427. https://doi.org/10.1016/j.wasman.2019.02.029.

European Commission. 1975. *Directive 75/445/EEC of 26 June 1975 Amending Directive No 66/404/EEC on the Marketing of Forest Reproductive Material*.

European Commission. 1991. *Directive 91/156/EEC of 18 March 1991 Amending Directive 75/442/EEC on Waste*.

European Commission. 2008. *Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on Waste and Repealing Certain Directives*.

Gharfalkar, Manisha, Ruth Court, Cathy Campbell, Zainab Ali, and Graham Hillier. 2015. "Analysis of Waste Hierarchy in the European Waste Directive 2008/98/EC." *Waste Management* 39: 305–313. https://doi.org/10.1016/j.wasman.2015.02.007.

Hendriks, Christiaan Frederik, and Bertus Johannes Hendrik Te Dorsthorst.. 2001. "Re-use of Constructions at Different Levels: Construction, Element or Material." In *CIB World Building Congress*, 1–11, April.

INSTAT 2022. Mbetjet e Ngurta Urbane, www.instat.gov.al

Kotaji, S., Schuurmans, A., & Edwards, S. (2003). Life-cycle Assessment in Building and Construction: A State-of-the-art Report, 2003. SETAC.

Muluken YeheyisKasun N. HewageKasun N. HewageM. Shahria AlamM. Shahria AlamRehan SadiqRehan Sadiq 2012. An overview of construction and demolition waste management in Canada: A lifecycle analysis approach to sustainability • • 10.1007/s10098-012-0481-6

Sakai, Shin-ichi, Hideaki Yoshida, Yasuhiko Hirai, Masako Asari, Hiroshi Takigami, Shuji Takahashi, et al. 2011. "International Comparative Study of 3R and Waste Management Policy Developments." *Journal of Material Cycles and Waste Management* 13: 86–102. https://doi.org/10.1007/s10163-011-0009-x.

Sharma, A., Saxena, A., Sethi, M., Shree, V., & Varun. (2011). Life cycle assessment of buildings: A review. Renewable and Sustainable Energy Reviews, 15(1), 871–875. https://doi.org/10.1016/j.rser.2010.09.008

Yeheyis, M., Hewage, K., Alam, M. S., Eskicioglu, C., & Sadiq, R. (2012). An overview of construction and demolition waste management in Canada: A lifecycle analysis approach to sustainability. Clean Technologies and Environmental Policy, 15. https://doi.org/10.1007/s10098-012-0481-6

Zero Waste Europe. 2019. "A Zero Waste Hierarchy for Europe." May. https://zerowasteeurope.eu/2019/05/a-zero-waste-hierarchy-for-europe/.

Zhang, C., Hu, M., Di Maio, F., Sprecher, B., Yang, X., & Tukker, A. (2022). An overview of the waste hierarchy framework for analyzing the circularity in construction and demolition waste management in Europe. Science of The Total Environment, 803, 149892. https://doi.org/10.1016/j.scitotenv.2021.149892