10th International Conference
MINING AND ENVIRONMENTAL PROTECTION
9 - 12 September 2026, Serbia

https://doi.org/10.46793/MEP26.253M

CUTTINGS RE-INJECTION (CRI) TECHNOLOGY AS A SUSTAINABLE ALTERNATIVE FOR DRILLING WASTE MANAGEMENT IN THE SERBIAN OIL INDUSTRY

Mirjanić Anastasija[1] (orcid.org/0009-0008-3965-2782, anastasija.mirjanic@rgf.bg.ac.rs)
Božović Vladislav[2] (vladislav.bozovic@nis.rs)
Crnogorac Miroslav[1] (orcid.org/0000-0002-8078-2684, miroslav.crnogorac@rgf.bg.ac.rs)
Danilović Dušan[1] (orcid.org/0000-0002-2969-040X, dusan.danilovic@rgf.bg.ac.rs)
Ilić Marija[1] (orcid.org/0000-0002-5184-6685, marija.g.ilic@rgf.bg.ac.rs)
Karović-Maričić Vesna[1] (orcid.org/0000-0002-6323-1311, vesna.karovic@rgf.bg.ac.rs)
Tomić Lola[1] (orcid.org/0000-0002-6107-1780, lola.tomic@rgf.bg.ac.rs)

[1]University of Belgrade, Faculty of Mining and Geology, Belgrade, SERBIA
[2]NIS a.d. Novi Sad, Novi Sad, SERBIA

Abstract: *During the exploration, drilling, and workover of oil and gas wells, significant quantities of drilling waste are generated, among which drilling mud and drill cuttings represent some of the most important environmental, technological, and economic challenges faced by the oil industry. Traditional approaches to the management of this waste in the Republic of Serbia have primarily relied on disposal in operational, mixed, and centralized waste pits, which, after decades of application, have resulted in the accumulation of large amounts of historical waste, occupation of agricultural land, and potential adverse impacts on soil and groundwater.*

Modern waste management approaches require a transition from simple waste disposal to sustainable waste management practices, with priority given to reducing waste generation, promoting reuse and recycling, and implementing technologies that enable permanent and environmentally safe disposal (the 5R principle). In this context, particular attention is devoted to the technology of injecting drilling mud and drill cuttings into deep, isolated geological formations, known as Cuttings Re-Injection (CRI) technology, which has been successfully applied in the global oil industry for many years.

This paper analyzes the technical, environmental, and regulatory requirements for the implementation of this technology in the Republic of Serbia, as well as the possibility of utilizing and repurposing existing depleted oil wells as potential injection wells. The application of CRI technology may be implemented provided that appropriate geological, technical, and environmental investigations are conducted beforehand and that suitable conditions, necessary infrastructure, and regulatory approvals are available. The injection of drilling mud and drill cuttings into deep geological formations could contribute to solving the problem of long-term management of drilling waste, reducing the need for new waste disposal sites, lowering waste management costs, and creating conditions for the reclamation of locations burdened by legacy drilling waste.

Keywords**:** *drilling mud, drill cuttings, waste management, Cuttings Re-Injection (CRI), oil industry*

1. INTRODUCTION

Although the oil and gas sector is crucial for tackling global energy needs, it is also recognized for generating waste streams that may be detrimental to the environment unless properly managed. During hydrocarbon exploration activities, such as drilling, production, and well workovers, large amounts of spent drilling fluids, drill cuttings and produced water. Spent drilling fluids and drill cuttings are of particular importance because they are continuously produced during drilling [1].

Drilling fluid is a complex engineered composition consisting of water-based or oil-based fluids with clays, polymers, inhibitors, weighting agents, and chemical additives that ensure well stability, transport drill cuttings, maintain formation pressure, and cool and lubricate the drilling equipment. Throughout time, changes to its physical and chemical properties occur owing to pollution by rock formations and formation fluids, thus a large portion of drilling mud is unrecoverable [2].

Waste management in drilling operations in the Republic of Serbia has relied on temporary storage in reserve pits and transportation to centralized disposal sites [3]. Years of such methods have brought about not only the buildup of historic drilling waste but also an ever-increasing waste disposal area as well as the importance of environmental monitoring in order to avoid soil and aquifer pollution.

The imposition of stringent environmental regulations has resulted in innovations in waste reduction, recycling, recovery, and waste disposal techniques that include the use of Cuttings Reinjection (CRI) [4].

The present paper analyzes innovative technologies for drilling waste management, with particular emphasis on Cuttings Reinjection. It examines global industry practices, current waste management in Serbia, and the geological, technical, and regulatory framework for implementing this technology.

2. MANAGEMENT OF WASTE DRILLING FLUIDS AND DRILL CUTTINGS GENERATED DURING WELL DRILLING OPERATIONS

The activities carried out during well construction, conversion, and hydrocarbon production generate significant amounts of waste, among which waste drilling fluids and drill cuttings are the most important. The petroleum industry faces major challenges in managing these wastes because of environmental hazards, strict regulations, and increasing disposal costs. Therefore, modern drilling waste management is based on the principles of waste prevention, recycling, reuse, and technologies that ensure safe treatment and disposal [1,7,8,9].

Drilling fluids are essential during drilling operations because they ensure safety and efficiency by removing drill cuttings, cooling and lubricating drilling tools, maintaining wellbore stability and formation pressure, preventing uncontrolled fluid influx, providing borehole measurements, and protecting equipment from corrosion [7].

Figure 1. illustrates the circulation of drilling fluid in drilling operations and the formation of drill cuttings at the surface. The drilling fluid is continuously pumped through the drill string and reaches the bit before returning to the surface via the annulus, transporting the drill cuttings to the surface for the purposes of separation and treatment.

Drilling fluids are complex systems consisting of a water- or oil-based liquid phase, bentonite clay, and various additives regulating density, rheology, filtration, pH, inhibition, and other properties. In the process of drilling, drilling fluids' characteristics alter constantly under rock formation and formation fluids. The drilling fluids can be categorized into several types, including those based on water-based fluids, synthetic-based fluids, oil-based fluids, emulsion fluids, polymer fluids, and specialized systems as well [10,11].

The improvements in drilling techniques have been accompanied by the evolution of waste management methods. Initially, disposal of used drilling fluids was done by putting them in reserve pits, which ensured operational efficiency but caused soil and groundwater pollution for a long time. This technique was then substituted by moving the drilling waste to centralized waste management facilities, but the long-standing issue still remains unsolved [2,9,11].

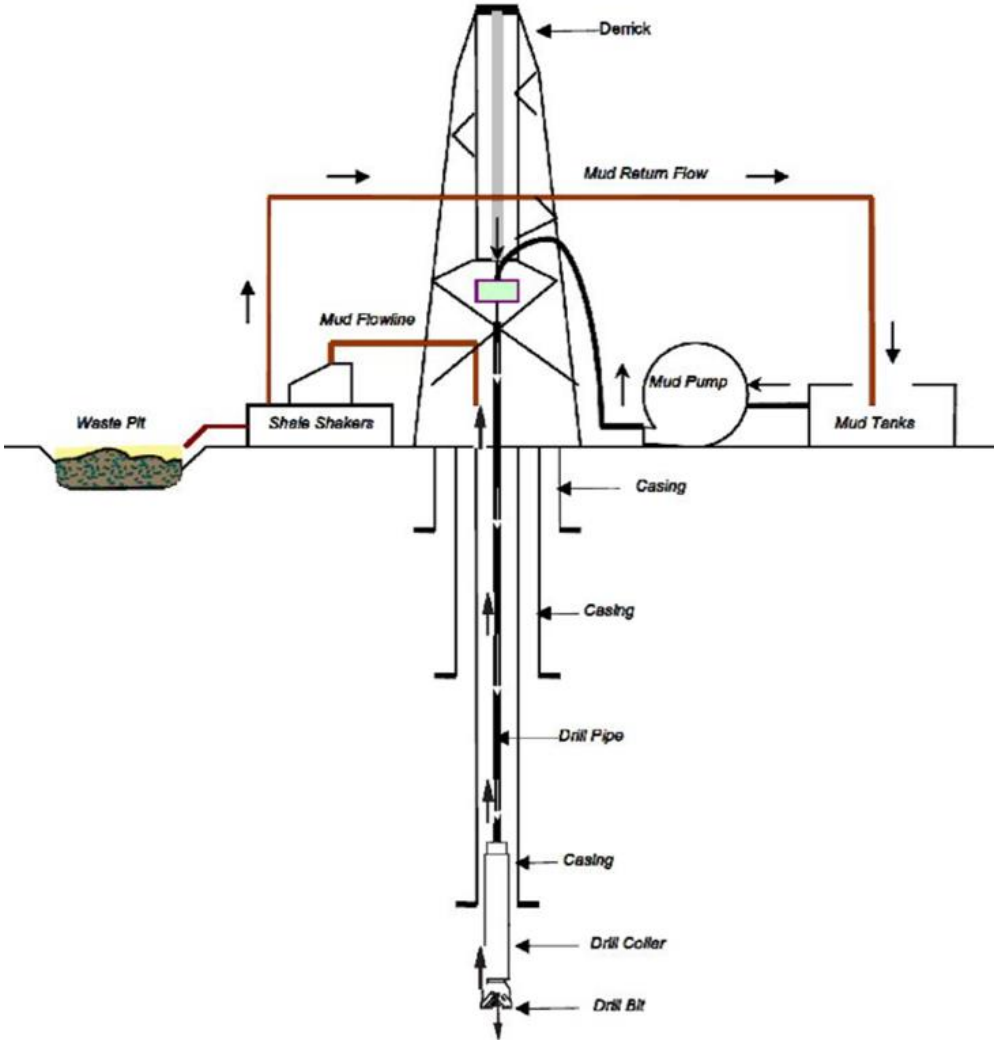


Figure 1. *Schematic of the drilling fluid circulation system and generation of drill cuttings during drilling operations [14]*

New technologies have made it possible to recycle and process the spent drilling fluids. Such technologies include the use of the drilling waste for the manufacturing of bricks and tiles, solidification and stabilization technologies, and other environmentally sound processes [12].

The concept of Zero Discharge has become increasingly important in modern drilling waste management. It aims to maximize drilling fluid recovery and reuse while minimizing waste generation through safe disposal technologies. Innovative Integrated Drilling Waste Management systems allow to collect, transport, separate, treat and dispose of drilling waste with state-of-the-art solids control technology, decreasing environmental impact, cost, and increasing efficiency of drilling operations [13].

3. MODERN APPROACHES TO DRILLING WASTE MANAGEMENT AND GLOBAL PRACTICES IN HANDLING WASTE DRILLING FLUIDS

The present-day methods of dealing with used drilling muds and cuttings are based on the principles of sustainable development, ecological safety, and efficient consumption of natural resources. Contrary to traditional waste management techniques, which were mainly concentrated on waste disposal, nowadays the emphasis is made upon waste prevention, reduction in the amount of waste produced, reuse, recycling, and recovery of drilling muds and organic substances. The choice of the way of waste disposal is influenced by legal requirements, the availability of technologies, geological characteristics, and the existing infrastructure. Therefore, there is no one-size-fits-all approach in drilling waste management [7, 11].

The most important aspect of current drilling waste processing is the hierarchy of waste management according to the five R principles—reduction, reuse, recycling, recovery, and disposal. Waste prevention is achieved through appropriate drilling fluid design and efficient drilling methods, while waste reuse is promoted for as long as possible.

Modern programs for oil waste disposal involve the development of drilling fluids, application of high-efficiency solids separation, shale shakers, hydrocyclones, chemical treatment, dewatering, reconditioning, thermal desorption, stabilization and solidification, bioremediation, and Cuttings Reinjection (CRI). Because of these technologies, the waste volume decreases significantly, drilling fluids can be reused for a longer period of time, drilling expenses decline, and environmental requirements are met [12, 14].

International experience shows that technologies for drilling waste management depend on environmental regulations, geological features, level of infrastructure development as well as economic conditions of a specific area. For example, Europe pursues the waste minimization strategy with a focus on recycling of drilling fluids and application of thermal and biological technologies. At the same time, the most effective approaches are applied in Norway and the UK where strict environmental regulations are followed in the course of drilling operations in offshore areas. It should be noted that modern technologies in the area of drill cuttings management are utilized in North America, especially in the US and Canada. The implementation of advanced systems for drilling fluid treatment and waste remediation methods such as thermal treatment and injection into deep wells is widely adopted in these countries. Australia, as well as the Middle East and Latin America, has also started to develop advanced drilling waste management methods due to the growing environmental laws and the necessity to protect fragile ecosystems. Worldwide, there's movement towards a complete waste management system that includes waste prevention, recycling, resource recovery, and safe disposal technologies, even as regional differences remain [1, 4, 11].

4. PERMANENT DISPOSAL OF DRILLING WASTE FLUIDS AND DRILL CUTTINGS THROUGH CUTTINGS REINJECTION (CRI) TECHNOLOGY

The increasing environmental regulation and focus on proper management of waste and drilled material have resulted in the development of technology that allows safe and environmentally friendly disposal of drilling waste. Compared with classic surface disposal methods, cuttings reinjection (CRI) is globally accepted as one of the most environmentally friendly mechanisms for the long-term disposal of drilling waste [15].

The CRI process was developed in the late 1980s as an affordable and long-term solution for the drilling waste disposal in cases where surface disposal was difficult. Since that time, the technology has been used in both offshore and onshore drilling operations and is now seen as one of the most effective methods for long-term drilling waste disposal [6, 16].

While conducting CRI operations, drill cuttings are broken down into suitable sizes and matched with either used drilling fluids or water to form a slurry. The mixture is gradually released under strict pressure into the targeted underground formation. Normally, the release forms and expands fractures in the receiving formation where the solid particles are placed. In order to keep the process safe, the fractures must remain cut in between the desired injection zone and the formation above [5, 11, 17].

As shown in Figure 2, two main configurations of cuttings reinjection are applied in practice: annular injection and injection through dedicated (abandoned) wells. The selection of the appropriate method depends on well availability, geological conditions, and the required injection performance [5].

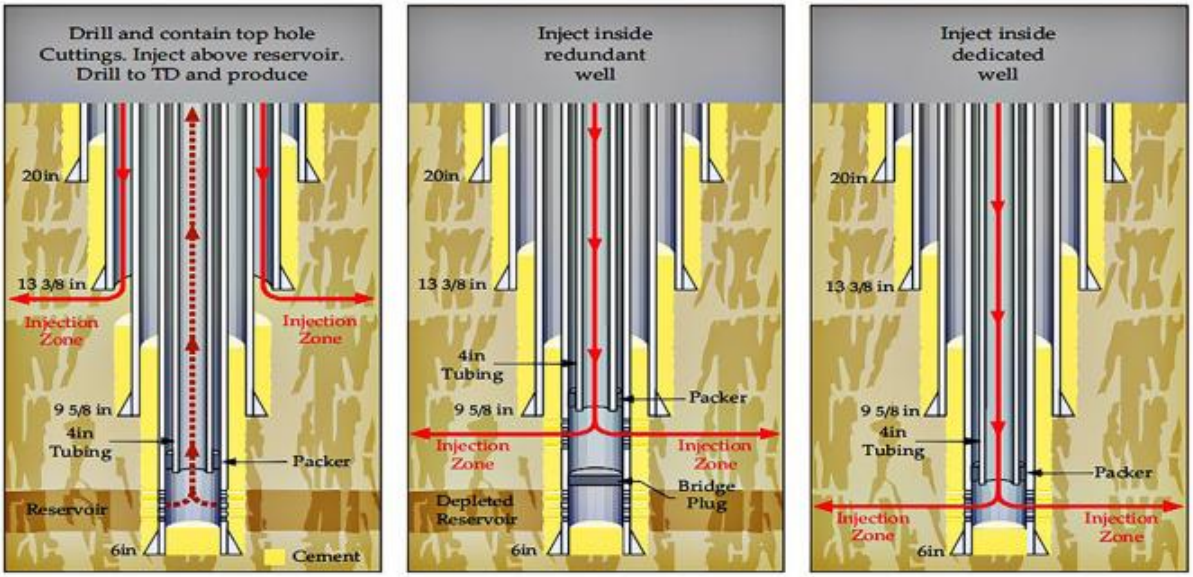


***Figure 2**. Cuttings re-injection options: left – annular injection, middle and right – dedicated (abandoned) well injection [5]*

For successful implementation of CRI technology, it is important to select a geological formation with adequate porosity, permeability, injectivity, geomechanical stability, and an impermeable cap rock to prevent fluid migration. Geological, hydrogeological, and geomechanical investigations are required to evaluate the feasibility and integrity of the injection well. The parameters during the injection process include pressure, temperature, injection speed and well condition and they are continuously monitored [11]. The overall implementation procedure is presented in Figure 3.

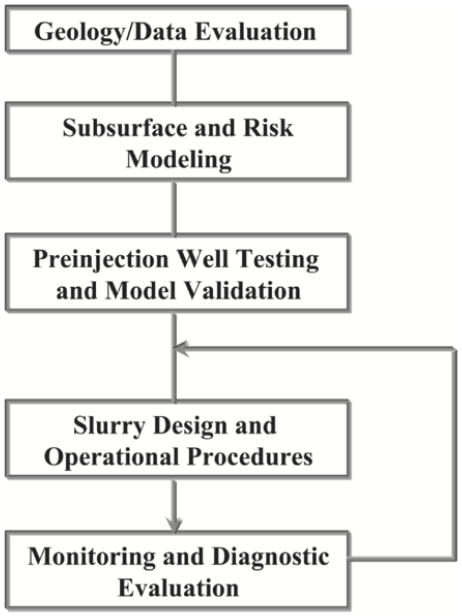


***Figure 3**. General workflow for planning, implementation, and monitoring of Cuttings Reinjection (CRI) operations [16]*

The main benefits of CRI technology are the permanent removal of drilling waste, elimination of surface disposal facilities and reserve pits, reduced risk of soil and groundwater pollution, lower land requirements, and the possibility of converting depleted wells into injection wells, thereby reducing capital and disposal costs [14].

Cuttings reinjection technology is one of the best options for the environmentally safe disposal of drilling cuttings because of its environmental and operational advantages, provided that thorough geological studies, engineering design, environmental evaluation, and continuous process monitoring are ensured [1, 14].

5. MULTI-CRITERIA DECISION-MAKING METHODOLOGY FOR EVALUATING CUTTINGS REINJECTION TECHNOLOGY

Choosing the drilling waste management technology requires sophisticated engineering decisions because it is a matter of balancing technical, economic, ecological, geological, and legislative factors. As these factors often contradict one another, the process of choosing one technology cannot depend only on one factor. Rather, it should take into consideration all factors that are relevant at the moment. Therefore, MCDM methods can be used more and more often in petroleum and environmental engineering for technology selection [18].

The paper made use of the combination of CRITIC and TOPSIS approaches. The CRITIC (Criteria Importance Through Inter Criteria Correlation) method was to establish criterion weights objectively from the point of view of variability of criterion values and correlation level between them; the above makes the application of expert weighting less subjective [19]. The weights derived from this exercise were then applied through the TOPSIS method (Technique for Order Preference by Similarity to Ideal Solution), commonly implemented within a multi-criteria decision-making process for ranking various alternatives. TOPSIS operates through the premise that the alternative should be the one closest to the ideal solution and furthest away from the worst solution, allowing for a complete assessment of alternatives based on multiple criteria [20, 21].

The framework suggested comprises of the following four crucial phases. Firstly, the evaluation options need to be identified, then the assessment criteria specified. The third phase is the use of the CRITIC method to determine the weights for the criteria. The last step is using the TOPSIS method to rank the options. Figure 4. illustrates the conceptual diagram of the implementation of the CRITIC-TOPSIS method.

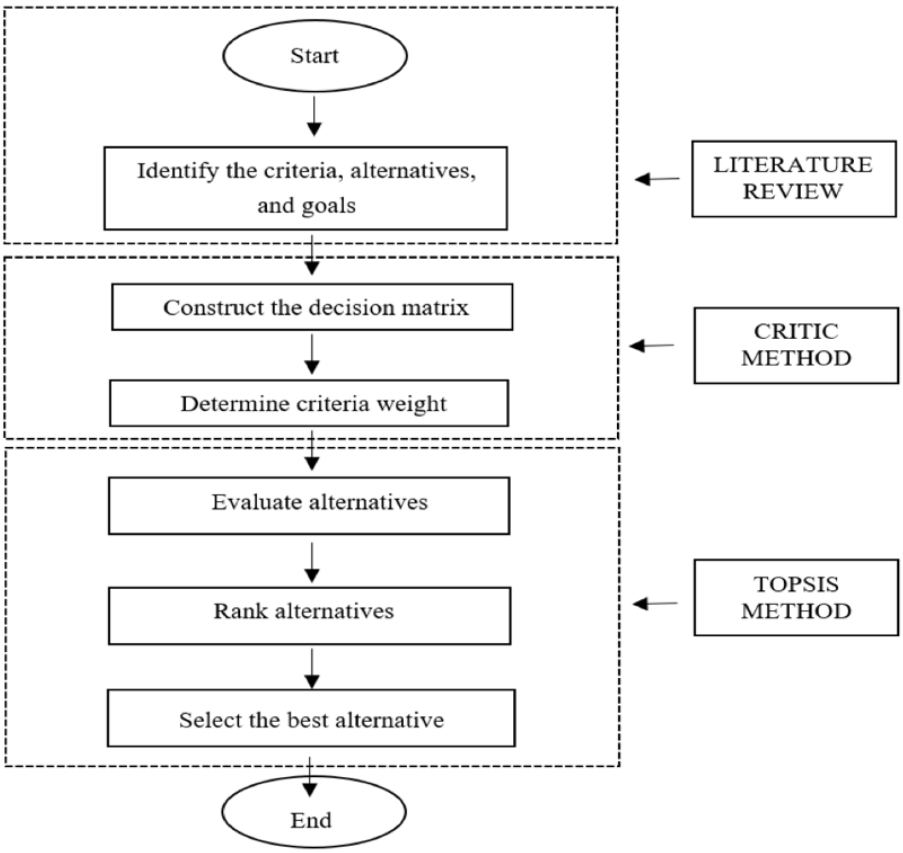


***Figure 4**. Conceptual Diagram of the CRITIC-TOPSIS method [21]*

6. APPLICATION OF MULTI-CRITERIA ANALYSIS FOR ASSESSING CRI TECHNOLOGY FEASIBILITY IN THE REPUBLIC OF SERBIA

In accordance with the concepts presented in the previous section of the paper, a new approach called CRITIC-TOPSIS was used to evaluate the effectiveness of Cuttings Reinjection (CRI) technology in the context of the Republic of Serbia.

Simply confirming that hydrocarbon production has stopped is insufficient to consider a well candidate for CRI. An analysis should be performed of such factors as the condition of the casing, the state of cement, prior workover history, injectivity of the formation, fracture pressure, cap-rock integrity and hydraulic isolation from freshwater aquifers. Prior to beginning large-scale injection, preliminary tests of step-rate and injectivity are necessary. Throughout the injection process parameters such as pressure, flow rate, density of the backfill and cumulative volume of injected slurry must be monitored continuously.

Permanently plugged and abandoned wells are also not necessarily suitable for CRI operations. A potentially suitable candidate would be an inactive or depleted well that remains technically accessible and can be safely converted into an injection well following a complete integrity assessment.

An extensive review of literature made it possible to identify the following three waste management processes that can be used in the oil fields of Serbia: A1 - conventional surface disposal, A2 - cuttings reinjection, with the use of wells that have already been used, and A3 - injection of cuttings in newly drilled wells. This has enabled comparison of existing methods of waste disposal in oil industry and two possible scenarios of implementation of CRI technology.

Eight criteria were chosen for the technology evaluation, representing the most important factors affecting the selection of technology: initial investment cost (C1), operating costs (C2), environmental safety (C3), geological suitability (C4), technical feasibility (C5), available infrastructure (C6), sustainability (C7), and regulatory compliance (C8). All criteria were treated equally as benefit criteria. In case of C1 and C2, the scores denote cost efficiency and not the absolute monetary value of the relevant costs. As a result, a higher score related to either C1 or C2 means that the alternative is more attractive and cost-effective. The scores related to any criterion are from 1 to 10, with 1 being the lowest performing alternative and 10 being the highest.

Table 1 presents the decision matrix based on the available technical information, international case studies, and assessment of the Serbian oil field conditions. A qualitative assessment scale from 1 to 10 was used to develop the decision matrix.

The scoring was based on the analysis of the scientific literature available, published CRI case studies, and the authors' evaluation of the current state in the oil sector in Serbia in a qualitative manner. A score of 1 signifies that the performance is very poor while a score of 10 signifies that it is very good. Given that site-specific geological and economic data could not be located, it should be considered a preliminary screening assessment.

Table 1. Decision matrix

Alternative	**C1**	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**
A1 – Surface disposal	9	3	2	10	9	10	2	7
A2 – CRI (existing well)	6	9	10	8	8	9	10	7
A3 – CRI (new well)	3	8	10	9	9	5	10	8

Table 2. Explanation of representative scores used in the decision matrix

Alternative –Criterion	**Score**	**Short justification**

A1–C1	9	Surface disposal requires low initial investment due to existing facilities.
A1–C3	2	Surface disposal has the highest environmental risk due to potential soil and groundwater contamination.
A2–C2	9	Conversion of existing wells reduces long-term disposal costs by utilizing available infrastructure.
A2–C3	10	Properly designed CRI provides permanent underground isolation of drilling waste.
A3–C1	3	A new injection well requires significant drilling and completion investment.
A3–C6	5	New infrastructure development increases implementation complexity.

After defining the decision matrix, the CRITIC (Criteria Importance Through Intercriteria Correlation) method was applied to determine the objective importance of the selected criteria. Unlike subjective weighting approaches, CRITIC evaluates the significance of each criterion according to two main characteristics: the degree of variation among alternatives and the correlation with other criteria. Therefore, criteria with higher information content obtain higher weights.The obtained criteria weights are presented in Table 3.

Table 3. Criteria weights obtained using the CRITIC method

Criterion	Description	CRITIC information value C_j	Weight w_j
C1	Initial investment cost efficiency	4.465	0.130
C2	Operating cost efficiency	4.036	0.118
C3	Environmental safety	4.272	0.125
C4	Geological suitability	4.055	0.118
C5	Technical feasibility	4.382	0.128
C6	Infrastructure availability	4.770	0.139
C7	Sustainability	4.272	0.125
C8	Regulatory compliance	4.035	0.118
Total		**34.287**	**1.000**

According to the findings from the CRITIC method, all criteria appear to have nearly the same weight. The maximum weight was assigned to the infrastructure availability (0.139), followed by the initial investment cost efficiency (0.130) and the technical feasibility (0.128). Compliance with regulations and some other criteria has a weight marginally lower than that of the preceding criteria. However, the small discrepancies in the weight confirm the absence of the decisive criterion in the decision-making process concerning the criteria under review.

The decision matrix was used to apply the TOPSIS method and the findings are illustrated in Table 4. showing that CRI using abandoned wells achieved the most advantageous closeness and thus the most attractive approach to the management of drilling waste in Serbia.

Table 4. TOPSIS ranking results

Alternative	Closeness coefficient	Rank
A2 – CRI using an existing well	0.753	1
A3 – CRI using a newly drilled well	0.563	2
A1 – Surface disposal	0.431	3

According to the findings of TOPSIS, the rank goes to CRI via a properly established existing well in the first place, while the closeness coefficients come up to 0.753. Applying CRI through a newly constructed injection well comes in the second place, and conducting traditional surface disposal takes the third rank. The key benefit of the method A2 is that it combines the already existing infrastructure with competitiveness of operating costs, environmental safety and sustainability.

Table 5. Sensitivity analysis of the TOPSIS results

Scenario	A1	A2	A3	First rank

CRITIC weights	0.431	0.753	0.563	A2
Equal weights	0.413	0.758	0.581	A2
Environmental priority	0.230	0.862	0.771	A2
Economic priority	0.484	0.700	0.485	A2

The sensitivity analysis used four different weighting methods. Specifically, under the equal-weight method, all the criteria were given the same weight of 0.125. The environmental-based analysis gave more weight to the environmental safety and sustainability criteria. Meanwhile, the economic assessment provided the greatest weights to the criteria that were assessing the initial and operating cost efficiency of the solution. A2 remains ranked as the top alternative for every considered method showing a good rank stability. However, the assessment has some limitations as well. For instance, the decision matrix was built mostly using secondary literature data and qualitative scores. Therefore, no actual well integrity data, formation injectivity levels, fracturing pressure, waste volumes, as well as investment and operational costs estimates were considered during the analysis. In addition, only three alternatives were used for the CRITIC weights calculation, which reduces the validity of the obtained results.

7. CONCLUSION

This paper presents an initial evaluation of cuttings reinjection as a drilling waste management option in the Serbian oil sector. CRITIC-TOPSIS findings conclude that CRI utilizing an operational well is the most favorable method, followed by using a newly constructed well and surface disposal. Sensitivity studies show that the first choice remains unaltered in all weight assignments.

However, these conclusions have been based mainly on literature - based qualitative data, and no field measurements were performed in the process. Thus, the findings cannot support the statement that any abandoned or decommissioned well in Serbia can be considered for CRI. Before being applied, the selected wells and the formation should be studied from geological, hydrogeological, geomechanical and well integrity perspectives. Moreover, it is necessary to perform an economic feasibility study, injection tests, environmental risk assessment and obtain all permits.

As a result, CRI using regular well can be classified as a potential alternative rather than a universal method. Therefore, the methodology can be applied to a specific oil field in Serbia for data acquisition in future research.

REFERENCES

1. Pereira, L.B.; Sad, C.M.S.; Castro, E.V.R.; Filgueiras, P.R.; Lacerda, V., Jr. Environmental impacts related to drilling fluid waste and treatment methods: A critical review. *Fuel* **2022**, *310*, 122301. https://doi.org/10.1016/j.fuel.2021.122301.
2. Ismail, A.; Alias, A.; Sulaiman, W.; Jaafar, M.; Ismail, I. Drilling Fluid Waste Management in Drilling for Oil and Gas Wells. *Chemical Engineering Transactions* **2017**, *56*, 1351–1356.
3. NIS. *Annual Report on Sustainable Development 2025*; NIS a.d. Novi Sad: Novi Sad, Serbia, 2026. Available online: https://www.nis.rs/wp-content/uploads/2026/06/IOR-2025-SRB-final.pdf (accessed on 20 July 2026).
4. Clements, K.; Veil, J.A.; Leuterman, A.J.J. Global Practices and Regulations for Land Application and Disposal of Drill Cuttings and Fluids. In *Proceedings of the SPE International Conference on Health, Safety and Environment in Oil and Gas Exploration and Production*, Rio de Janeiro, Brazil, 12–14 April 2010. Society of Petroleum Engineers: Richardson, TX, USA, 2010.
5. Shokanov, T.; Gumarov, S.; Ronderos, J.; Fragachán, F.E. Multiple-Fractures Propagation, Orientation and Complexities in Drilling Waste Injection. In *Proceedings of the SPE Hydraulic Fracturing Technology Conference*, The Woodlands, TX, USA, 24–26 January 2011. Society of Petroleum Engineers: Richardson, TX, USA, 2011.
6. Zhang, S.; Feng, Y.; Li, B.; Deng, J.; Geng, T.; Zhang, J. Fracture development during disposal of hazardous drilling cuttings by deep underground injection: A review. *Journal of Rock Mechanics and Geotechnical Engineering* **2022**, *14*, 1652–1670.

7. Fink, J.K. *Petroleum Engineer's Guide to Oil Field Chemicals and Fluids*; Gulf Professional Publishing: Kidlington, UK, 2012.
8. Caenn, R.; Darley, H.C.H.; Gray, G.R. *Composition and Properties of Drilling and Completion Fluids*, 7th ed.; Gulf Professional Publishing: Houston, TX, USA, 2017.
9. Njuguna, J.; Siddique, S.; Kwroffie, L.B.; Piromrat, S.; Addae-Afoakwa, K.; Ekeh-Adegbotolu, U.; Oluyemi, G.; Yates, K.; Mishra, A.K.; Moller, L. The fate of waste drilling fluids from oil & gas industry activities in the exploration and production operations. *Waste Management* **2022**, *145*, 362–380.
10. Aquiptec. *Drilling Mud Disposal: 5 Brilliant Techniques Everyone Must Know*. Available online: https://aquiptec.com.au/article/drilling-mud-disposal-techniques/ (accessed on 20 July 2026).
11. International Association of Oil & Gas Producers (IOGP). *Drilling Waste Management Technology Review*; Report 557, 2016. Available online: https://www.iogp.org/bookstore/wp-content/uploads/sites/2/woocommerce_uploads/2017/01/557.pdf (accessed on 20 July 2026).
12. Lebedev, A.; Cherepovitsyn, A. Waste Management during the Production Drilling Stage in the Oil and Gas Sector: A Feasibility Study. *Resources* **2024**, *13*, 26.
13. Society of Petroleum Engineers. *Drilling Waste Management*. Available online: https://onepetro.org/spe/general-information/1486/Drilling-waste-management (accessed on 20 July 2026).
14. Zoveidavianpoor, M.; Samsuri, A.; Shadizadeh, S.R. *Drilling Fluids and Their Environmental Impact*. InTech: Rijeka, Croatia, 2012.
15. Shadizadeh, S.R.; Majidaie, S.; Zoveidavianpoor, M. Investigation of Drill Cuttings Reinjection: Environmental Management in Iranian Ahwaz Oilfield. *Petroleum Science and Technology* **2011**, *29*, 1093–1103.
16. Guo, Q.; Geehan, T.; Ovalle, A. Increased Assurance of Drill Cuttings Reinjection: Challenges, Recent Advances, and Case Studies. *SPE Drilling & Completion* **2007**, *22*, 99–105.
17. Xia, G.; Bilak, R.; Marika, E.; Al-Shehri, H.A.; Al-Qahtani, F.Y. Performance Assessment of Cuttings Re-Injection (CRI) Operations at the Manifa Oil Field, KSA. In *Proceedings of the ISRM Conference on Rock Mechanics for Natural Resources and Infrastructure*, Salvador, Brazil, 2014. International Society for Rock Mechanics and Rock Engineering, 2014.
18. Triantaphyllou, E. *Multi-Criteria Decision Making Methods: A Comparative Study*; Springer: New York, NY, USA, 2000.
19. Diakoulaki, D.; Mavrotas, G.; Papayannakis, L. Determining objective weights in multiple criteria problems: The CRITIC method. *Computers & Operations Research* **1995**, *22*, 763–770.
20. Behzadian, M.; Otaghsara, S.K.; Yazdani, M.; Ignatius, J. A state-of-the-art survey of TOPSIS applications. *Expert Systems with Applications* **2012**, *39*, 13051–13069.
21. Yazid, N.A.; Sabtu, N.I.; Azmiral, N.U.S.; Mahad, N.F. The Application of CRITIC-TOPSIS Method in Solving the Material Handling Equipment Selection Problem. *Malaysian Journal of Computing* **2023**, *8*, 1310–1330.