Paste 2026 – AB Fourie, M Horta, M Oliveira & S Wilson (eds)

doi:10.36487/ACG_repo/2655_48

Economic comparison of different tailings management methods using present worth of costs: case study of processing plants in eastern and central Iran

Behnaz Mirshekari [a,*], Mohammad Emadi [a], Shahram Hashemi Marghzar [a], Hosein Pour Khadem Namin [a]

[a] *Amatis Rabin Consulting Engineers, Islamic Republic of Iran*

Abstract

Effective tailings management in water-scarce regions is a critical challenge for the mining industry, particularly in areas where land availability is constrained by topography and regulatory restrictions. This issue is highly relevant in the iron ore mines of eastern and central Iran, where both water scarcity and spatial limitations intensify the need for efficient and sustainable tailings disposal strategies. This study presents a techno-economic evaluation of 2 commonly applied methods of tailings management: the use of paste thickeners in combination with tailings dams, and filtration followed by dry stacking.

The economic assessment was carried out using the present worth of costs methodology, allowing for a consistent comparison of alternatives over equivalent operational lifespans. A hypothetical case study was developed for a dewatering and tailings management facility designed to handle 1 million tonnes of dry tailings annually. The analysis focused on both capital and operating costs, with special emphasis on the influence of water supply costs on the overall economic performance of each method.

Results indicate that the economic viability of tailings management is highly sensitive to the unit cost of water. When water costs are below EUR 1.5/m³, paste thickener–tailings dam systems demonstrate greater cost-effectiveness primarily due to lower operating expenditures. However, as water costs rise above EUR 1.5/m³, filtration and dry stacking become the more favourable option, owing to significant reductions in water consumption and associated costs. It should be noted that the current evaluation does not incorporate environmental or social risks, such as those related to tailings dam failures.

Overall, the findings highlight that in arid and semi-arid mining regions, water supply costs are the decisive factor in selecting an appropriate tailings management strategy. While paste thickeners may be advantageous under low-cost water conditions, the filter press–dry stacking method emerges as a more economically robust and potentially sustainable solution in the face of increasing water scarcity and growing environmental concerns.

Keywords: *tailings management, paste thickener, tailings dam, pressure filter, dry stacking, present worth of costs*

1 Introduction

Effective management of mine tailings is one of the most significant challenges in the mining industry due to its extensive environmental, social, and economic implications. The importance of this issue is even greater in arid regions and areas with land limitations caused by topography. Moreover, the enforcement of increasingly stringent environmental regulations by governmental authorities has made the selection of an appropriate tailings management strategy a serious challenge. As by-products of ore processing, tailings can cause severe environmental impacts if not properly managed, including contamination of water resources,

[*] Corresponding author. Email address: b.mirshekari@amara.ir

loss of usable land, and increased environmental and social risks such as catastrophic tailings dam failures. Therefore, selecting a suitable tailings management method requires a comprehensive approach that is not only technically and economically feasible but also environmentally and socially sustainable. Such an approach should minimise the risk of dam failure, conserve resources such as water, energy, and land, and mitigate environmental impacts (Carneiro et al. 2019).

Most mineral processing operations are carried out by wet methods to separate valuable minerals from gangue, so the resulting tailings contain a considerable amount of water. The management and storage of these tailings are of particular importance. Conventional tailings management methods in the mining industry can generally be classified into 2 categories: wet tailings management and dry stack tailings management. In the wet method, tailings are transported from the thickener to a tailings dam as slurry with a solids content of approximately 50–65%. Tailings dams are traditionally designed to store large volumes of slurry and water collected from the dam surface is returned to the processing circuit. Despite its widespread use, this method is associated with several major drawbacks, including the risk of dam failure, seepage and contamination of groundwater, large land requirements for dam construction, extensive earthworks, low water recovery, and high evaporation rates in arid climates. Numerous cases of tailings dam failures around the world, along with increasing water scarcity and limited tailings storage space, have highlighted the urgent need to reconsider current tailings management approaches (Williams et al. 2017; Loftus 2025).

In contrast, dry stack tailings management has emerged in recent decades as an advanced and sustainable technology. In this approach, tailings discharged from the thickener are subjected to mechanical dewatering using equipment such as filter presses, which reduce their moisture (process water content) to approximately 15–20%. The resulting product is a transportable dry cake that can be safely stacked in designated storage areas, known as ‘dry stacks’. This method eliminates the need for a wet tailings dam and allows for safer, more sustainable, and more controllable management of tailings. The key advantages of the dry method include up to 80% reduction in water consumption through recycling within the processing circuit, improved geotechnical stability and reduction of dam failure risks, a smaller environmental footprint, and reduced requirements for specific topography or large-scale earthworks. Furthermore, in arid and semi-arid regions where water supply is a limiting factor for production, dry stack tailings technology can play a crucial role in ensuring process water sustainability and reducing long-term water supply costs (Phillips et al. 2025; Maré 2025).

Overall, the global trend in the mining industry has shifted toward dry tailings management, driven by a combination of economic, environmental, and social factors. With growing demands for environmental sustainability, risk management, and social responsibility, the implementation of advanced filtration technologies and the design of dry stacking systems offer an effective and sustainable solution for mines of various scales. Figure 1 illustrates the historical trend in the utilisation of different tailings management methods. As shown, the use of filter presses and dry stacking began around 1980 and increased significantly after 1990. The data are updated to 2010, and recent studies indicate that the number of filtration units has continued to rise substantially in recent years, with projections showing even more pronounced growth in the coming decades (Gomes et al. 2016; Davies et al. 2011).

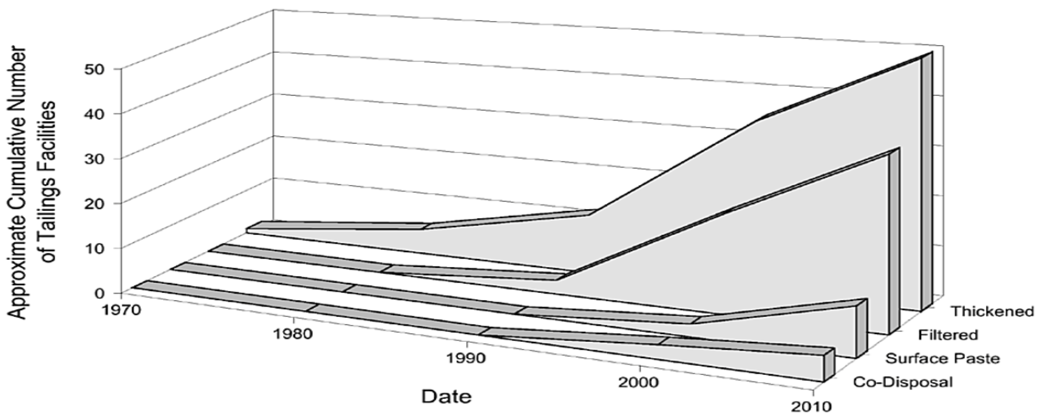


Figure 1 Trends in use of dewatered tailings in mining (Davies et al. 2011)

In Iran, mines located in the central and eastern regions represent the largest and most important sources of raw materials for various industries. The growing mining activities in these areas which have both water scarcity and limited space due to topography, have led to the generation of enormous volumes of tailings, intensifying the need for efficient and sustainable disposal solutions. Accordingly, the present study aims to evaluate the economic feasibility of 2 major tailings management methods in iron and copper mines of central and eastern Iran. The results of this study can provide a solid foundation for optimal decision-making and contribute to achieving sustainable mining both nationally and globally.

To select the most appropriate tailings management option, an integrated economic analysis based on the present worth of costs (PWC) approach was conducted. This economic evaluation method allows for a consistent comparison between alternatives over an equivalent operational lifetime. In this study, 2 scenarios were considered for a hypothetical dewatering and tailings management facility with a processing capacity of 1 million tonnes of dry tailings per year and an operational lifespan of 20 years. In each scenario, operational and capital costs, water recovery, and the costs associated with make-up water supply, were included:

1. use of paste thickener and construction of tailings dam
2. use of filter press and dry stack tailings.

2 Materials and method

2.1 The conceptual case study

The present case study focuses on the dewatering and management of tailings generated by iron and copper processing plants in the central and eastern regions of Iran. These areas generally exhibit hot, arid, or semi-arid climates and face water scarcity due to low rainfall and high evaporation rates. Table 1 presents the average annual precipitation, evaporation, and wind speed for selected industrial and mining cities in these regions.

Table 1 Climatic data of several cities in eastern and central Iran

City	Annual average precipitation (mm)	Annual average evaporation (mm)	Wind speed (km/h)
Yazd	54	3,100	17
Ardakan	55	3,200	13
Kerman	126	1,500	19
Sirjan	94	1,200	19
Zahedan	99	3,000	22
Birjand	138	1,180	26
Khaf	183	2,200	18

Processing circuits in iron and copper plants in central and eastern regions of Iran typically include crushing, grinding, magnetic separation (for iron), flotation (for copper and iron), and dewatering. Currently, the tailings produced by these plants are discharged into downstream tailings dams. Limitations in available land for constructing additional tailings dams, scarcity of water resources, and environmental regulations have compelled these plants to seek sustainable and efficient alternatives for tailings dewatering and management. Due to variations in the capacities of the studied plants, this research assumes a hypothetical dewatering and tailings management facility with a processing capacity of 1 million tonnes of dry tailings per year. The operational lifespan for both alternatives is considered to be 20 years. Table 2 summarises the key parameters considered for each option. The area required for tailings deposition has been calculated assuming a 16 m dam depth for the paste thickener and tailings dam scenario, and a 16 m stack height for the filter press and dry stack tailings option.

Table 2 Main selected design consideration for each tailings management option

Item	Unit	Tailings management options	
		Paste thickener and dam	Pressure filter and dry stacking
Capacity	t/y	1,000,000	1,000,000
Solid flow rate in feed	tph	126.26	126.26
Solids content	%	62	80
Annual water consumption	m^3	612,903	250,000
Tailings storage facility (TSF) layout	–	Dam	Dry stack
Tailings transport system	–	Pumps and pipeline	Trucks
Tailings disposal method	–	central thickened discharged or equal	Placement by dozers
TSF footprint area	m^2	1,197,163	743,534

Figures 2 and 3 provide satellite images of 2 representative processing plants in the eastern and central regions of Iran, illustrating the 2 tailings and water management approaches. Tailings management at the Rangin Felez copper mine uses a paste thickener and a conventional tailings dam and has been in operation since 2008, whereas at the Iju Mine, filter press and dry stack tailings deposition system has been operational since 2021. The Rangin Felez copper mine is located adjacent to the Miduk mining complex, and its tailings are discharged from the paste thickener to the Miduk tailings dam.

Figure 2 Tailings management in Rangin Felez copper mine

Figure 3 Tailings management in Iju copper mine

2.2 Present worth of costs

For the economic assessment of various industrial and mining projects, methodologies vary depending on project type. Factors such as project lifespan, financing sources, and intended project use have a significant impact on financial and economic evaluations.

Since financial and economic studies for water recovery projects are primarily based on minimising capital and operational costs (as these processes do not produce a specific product but only recover water), the most suitable approach for evaluating these projects is the PWC method. To compare different alternatives economically, it is assumed that the project lifespan is identical across all options, and differences arise solely from the costs associated with each option. The present worth method is applicable to mutually exclusive projects, where selecting one project precludes the implementation of others, i.e. projects are independent of each other. The PWC is calculated using the following formula:

$$\begin{cases} P = A_1 \left[\frac{1-(1+j)^n(1+i)^{-n}}{i-j}\right] & i \neq j \\ P = \frac{nA_1}{1+i} & i = j \end{cases} \quad (1)$$

where:

P = present worth of costs

J = annual percentage increase

I = discount rate

N = number of years of the project (project lifespan)

A1 = first receipt or payment.

The minimum acceptable rate of return (MRR) varies depending on investor characteristics (age, experience, capital, risk tolerance, etc.), meaning a project may be considered economical for one company and uneconomical for another. If the return on investment of a project equals or exceeds the MRR, the project is considered economically viable.

When comparing projects based on the PWC, only the costs associated with each alternative are considered, without accounting for any revenues or profits. This approach is particularly suitable for projects that do not generate a specific product, such as water recovery or tailings management initiatives, where the main objective is to minimise capital and operational expenditures. In this framework, all future costs are discounted to their present value, allowing a direct comparison of different alternatives over the same project lifespan. The most economical option is the one with the lowest PWCs, as it represents the least financial burden over the project life. This method assumes that the projects are independent, mutually exclusive, and have equal operational durations (Newnan 2019; Hahn et al. 2025). In this study, this technique is used as the methodology to compare the selected options for water and tailings management.

2.3 Cost parameters and assumptions

Table 3 summarises the main cost items for the 2 categories (capital investment and operating costs) for the 2 tailings management options: use of paste thickener and tailings dam, and use of filter press and tailings dry stacking). The Figures 4 and 5 show photographs of the case studies corresponding to the 2 mentioned options, representing the tailings dewatering and management units of the Rangin Felez and Iju copper concentrator plants, respectively.

Table 3 Major cost items considered for each option

Item	Tailings management options	
	Paste thickener and dam	**Pressure filter and dry stacking**
Capital cost	Paste thickener	High-rate thickener
	Tailings pumps	Tailings pumps
	Tailings pipeline	Tailings pipeline
	Electrical and control instrument	Electrical and control instrument
	Raw and return water pumps and pipeline	Raw and return water pumps and pipeline
	Flocculant system	Flocculant system
	Tailings dam construction	Pressure filter and belt conveyor
	Main buildings, e.g. electrical room, etc.	Compressed air system
		Main buildings, e.g. electrical room, etc.
Operating cost	Electrical energy	Electrical energy
	Water	Water
	Flocculant	Flocculant
	Maintenance and spare parts	Maintenance and spare parts
	Personnels (human resources)	Personnel (human resources)
		Tailings transport

Figure 4 Tailings management unit in Rangin Felez copper mine

Figure 5 Tailings management unit in Iju copper mine

3 Result and discussion

3.1 Capital costs

The summary of capital investment costs for the 2 options (paste thickener and tailings dam, and filter press with dry stack tailings) is presented in Table 4. These prices are based on 2025 information and reflect Iran's economic conditions, and may vary across different countries.

Table 4 Capital costs for each option

Item	Unit	Tailings management options	
		Paste thickener and dam	Pressure filter and dry stacking
Initial capital costs	EUR	4,499,077	4,528,192
Capital costs over time	EUR	2,983,051	0
Total capital costs	EUR	7,482,128	4,528,192

3.1.1 Paste thickener and tailings dam

The initial and ongoing capital investment costs for the paste thickener and tailings dam option are detailed in Table 5. This table includes the main initial capital costs as well as additional capital costs incurred during the project, which are related to raising the tailings dam walls to increase storage capacity in the fifth and tenth years of the project.

Table 5 Capital costs for paste thickener and tailings dam construction and uprising

No	Item	Total costs (EUR)
1	Pipeline and fittings to transporting tailings from the thickener to dam	5,297
2	Paste thickener	1,284,133
3	Distributor	6,780
4	Return water pump station and reservoir	46,610
5	Return water pumping system	95,410
6	Flocculant system	121,017
7	Flocculant, electrical and control buildings	67,797
8	Electrical equipment and transformers, etc.	160,169
9	Tailings dam construction and uprising	5,694,915
Total		1,787,213

3.1.2 Pressure filter and dry stacking

The capital costs for the pressure filter and dry stack tailings option are presented in Table 6.

Table 6 Capital costs for pressure filter and dry stacking

No	Item	Total costs (EUR)
1	Pressure filters and spare parts	2,323,765
2	Pressure filters buildings	322,034
3	Compressed air system	115,678
4	Pressure filters feed tank and its agitator	46,949
5	Pressure filters feed pumps	225,000
6	Belt conveyors and structure for tailings stacking	211,864
7	Pipeline and fittings to transporting tailings	5,297
8	High-rate thickener and its underflow pumps	722,280
9	Distributor	6,780
10	Return water pump station and reservoir	46,610
11	Flocculant system	71,780
12	Return water pumping system	95,410
13	Flocculant, electrical and control buildings	67,797
14	Electrical equipment and transformers, etc.	266,949
Total		4,528,192

3.2 Operating costs

Pricing indices for operating costs are summarised in Table 7, while the total operating costs for the 2 options (paste thickener and tailings dam, and filter press with dry stack tailings) are presented in Figure 6. These costs are provided considering 5 different water prices (1, 1.5, 2, 3, and 4 EUR/m³).

Table 7 Pricing indices for operating costs

No	Item	Unit	Cost
1	Earth work price	EUR/m3	1.74
2	Flocculant	EUR/kg	2
3	Electricity	EUR/kw	0.06
4	Water	EUR/m^3	2
5	Gasoil for earth work	EUR/lit	0.03

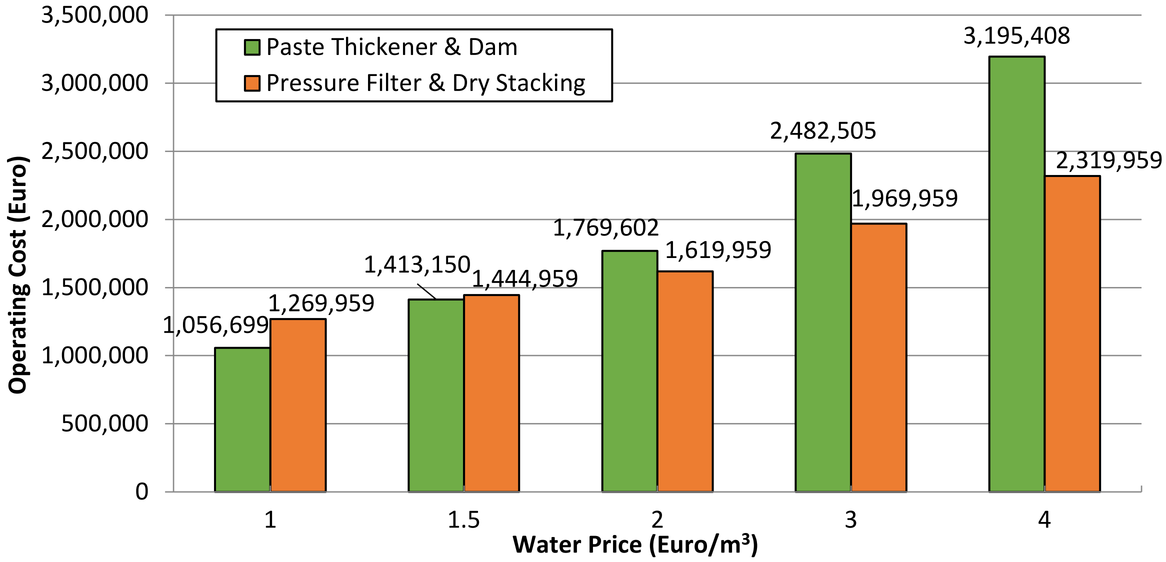


Figure 6 Operating costs for each option with different water price

3.2.1 Paste thickener and tailings dam

Operating costs for the paste thickener and tailings dam option are detailed in Table 8, assuming a water price of EUR 2/m^3. Water costs in the utility section and electricity costs in the energy section have been included.

Table 8 Operating costs for paste thickener and dam

No	Item	Total costs (EUR)
1	Utilities	1,525,806
2	Maintenance	99,141
3	Personnel	54,366
4	Energy	133,056
Total		1,812,370

3.2.2 Pressure filter and dry stacking

Operating costs for the filter press and dry stacking option are presented in Table 9, also assuming a water price of EUR 2/m^3, with water and electricity costs accounted for in the utility and energy sections, respectively.

Table 9 Operating costs for pressure filter and dry stacking

No	Item	Total costs (EUR)
1	Utilities	750,000
2	maintenance	245,714
3	Personnel	71,817
4	Energy	380,160
5	Tailings transport	381,356
Total		1,829,047

3.3 Present worth of costs

The PWC for the 2 options (paste thickener and tailings dam, and filter press with dry stack tailings) is summarised in Figure 7, considering the 5 different water prices (1, 1.5, 2, 3, and 4 EUR/m³). According to the results presented at a water price of EUR 1/m³, the PWC for the 2 options is approximately the same; however, as water prices increase, the PWC for the filter press and dry stacking option becomes lower. This difference between the options increases markedly with higher water prices.

Since the economic assessment of these projects was conducted using the PWC method, the alternative with the lowest present worth of costs is considered the most suitable. Therefore, at water prices below EUR 1.5/m³, the preferred option is the paste thickener and tailings dam, whereas at water prices above EUR 1.5/m³, the filter press and dry stacking option becomes the more favourable alternative. When water prices exceed EUR 2/m³, the economic difference between the 2 options is significant, making the filter press and dry stacking option the clear choice.

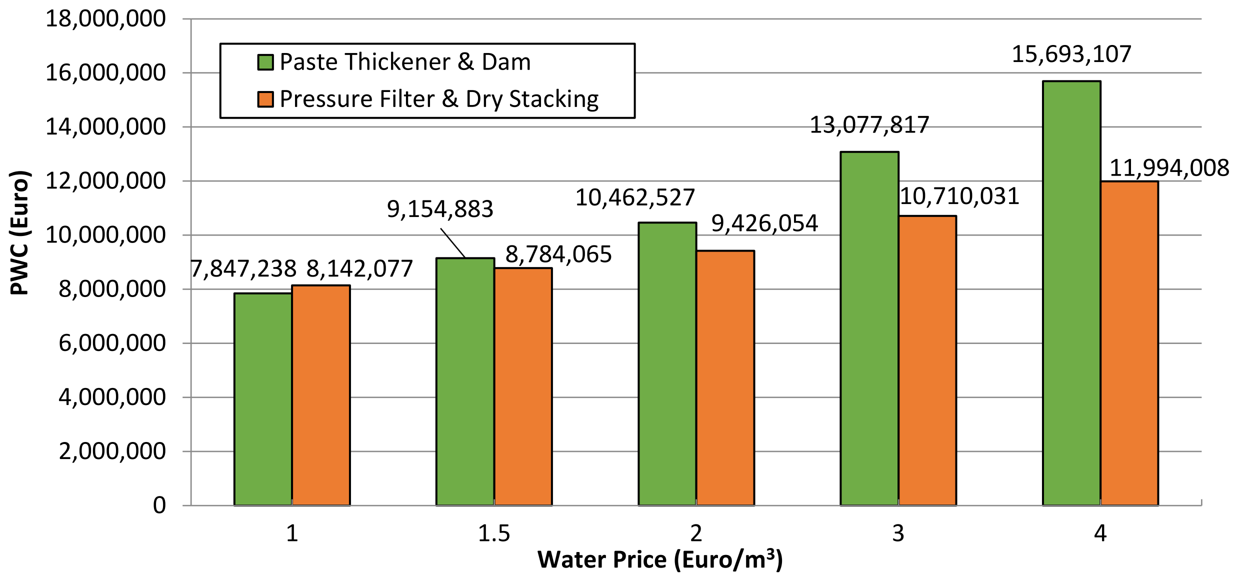
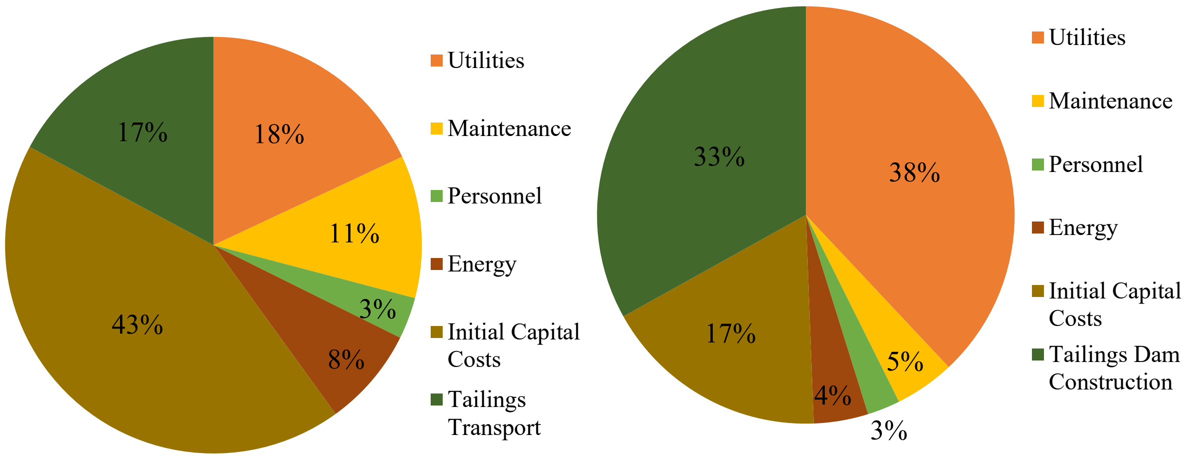


Figure 7 Present worth of costs (PWC) for each option with different water price

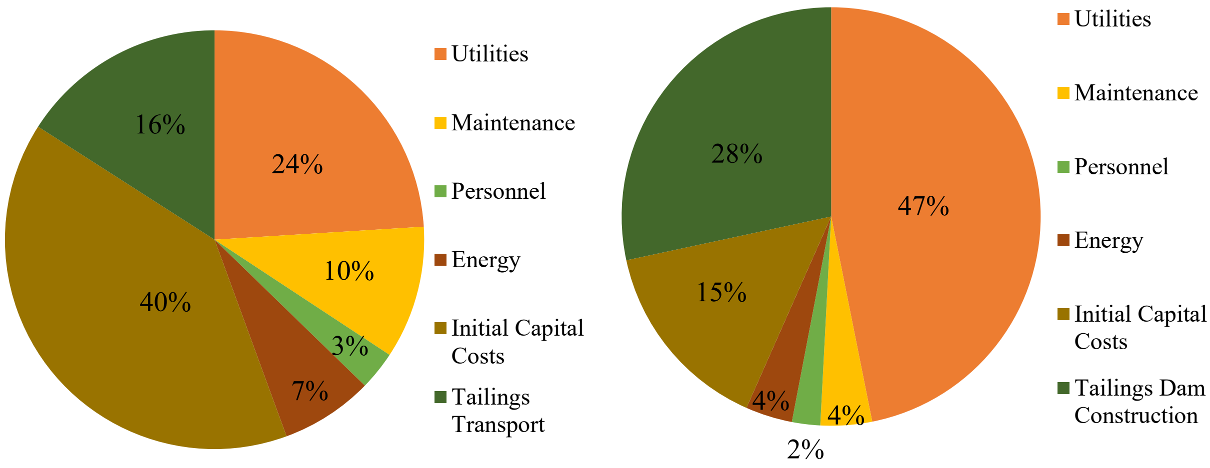
Figures 8 to 12 show the present worth of each cost component for the 2 options with different water prices. In these charts, water price is included in the utility section. For the paste thickener and tailings dam option, even at the lowest water price, the majority of the costs are attributed to the utility section, primarily representing water costs. The share of this component starts at 38% of total costs at water price of EUR 1/m³ and increases to 69% at water price of EUR 4/m³. This demonstrates the critical importance of water pricing in dewatering and tailings management projects. According to these charts, for the paste thickener and tailings dam option, if the water price increase to EUR 2/m³, water costs account for over 50% of total project costs, while other costs such as dam construction and initial capital costs rank second and third, respectively.

For the filter press and dry stacking option, at water prices below EUR 3/m³, the highest cost component corresponds to initial capital costs. At a water price of EUR 3/m³, water costs and initial capital investment are almost the same percentages of the total costs. However, as water prices increase to EUR 4/m³, water cost comprises the main part of the total costs, followed by initial capital investment in second place and tailings transportation costs in third. The difference between the 2 options (paste thickener and tailings dam, and filter press with dry stack tailings) is due to differences in water consumption in the 2 methods. The lower water consumption and higher water recovery in the filter press and dry stacking method reduce its sensitivity to water prices compared to the paste thickener and tailings dam option.



(a) (b)

Figure 8 Present worth of costs parts for (a) pressure filter and (b) paste thickener (water price = EUR 1)



(a) (b)

Figure 9 Present worth of costs parts for (a) pressure filter and (b) paste thickener (water price = EUR 1.5)

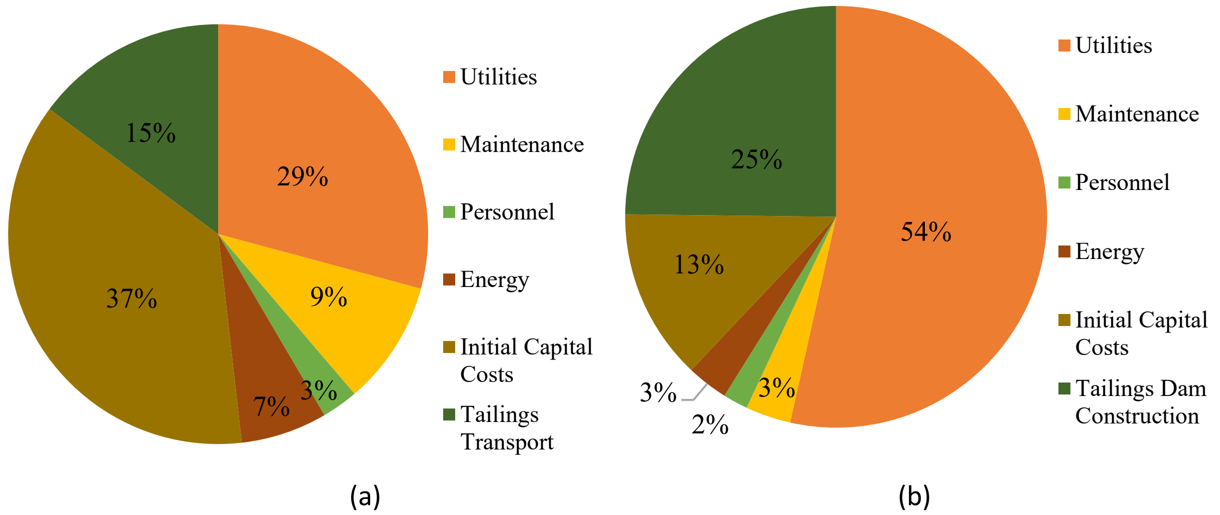


Figure 10 Present worth of costs parts for (a) pressure filter and (b) paste thickener (water price EUR 2)

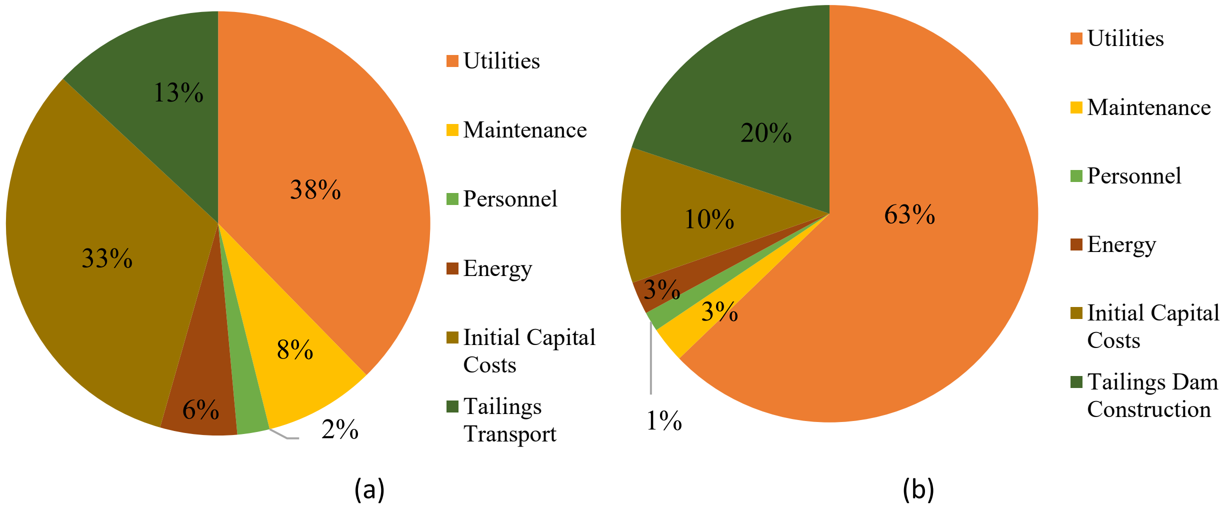


Figure 11 Present worth of costs parts for (a) pressure filter and (b) paste thickener (water price = EUR 3)

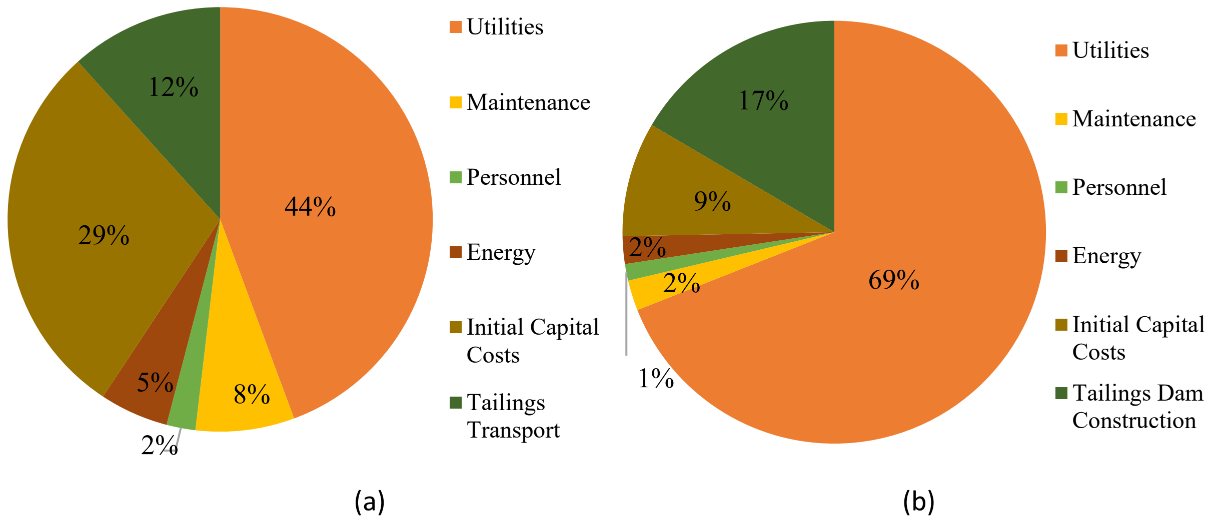


Figure 12 Present worth of costs parts for (a) pressure filter and (b) paste thickener (water price = EUR 4)

3.4 Annual costs for the 20-year project operation

3.4.1 Paste thickener and tailings dam

Figure 13 presents the total annual costs over the 20-year project lifespan for the paste thickener with and tailings dam option. All initial capital costs occur in the first year. Half of the dam construction costs are allocated to the first year, and the remaining half are distributed in the fifth and tenth years for dam raising. Other costs include operating costs, such as utilities (mainly water), energy, personnel, and maintenance, which increase gradually over time.

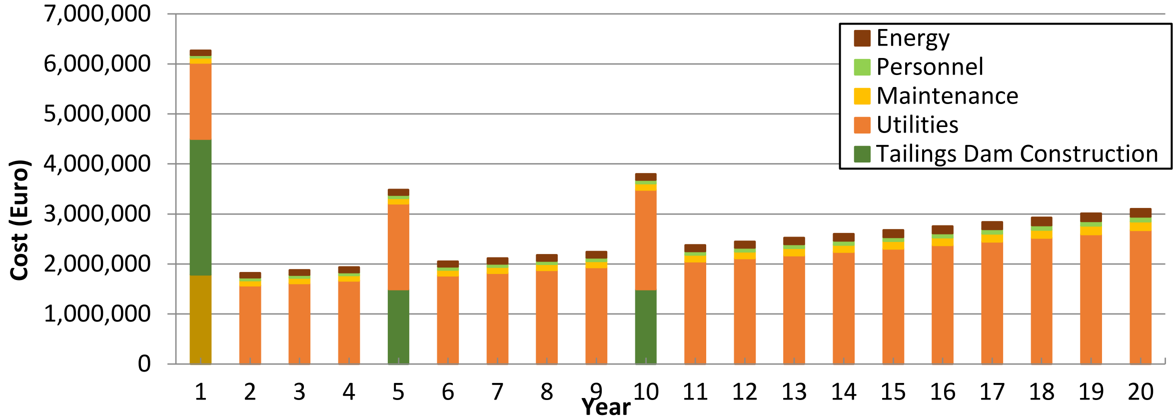


Figure 13 Annual total costs for paste thickener and tailings dam (water price = EUR 2)

3.4.2 Pressure filter and dry stacking

Figure 14 presents the total annual costs over the 20-year project lifespan for the filter press and dry stacking option. All initial capital investment costs occur in the first year. Other costs include operating costs, such as utilities (mainly water), tailings transportation, energy, personnel, and maintenance, which increase gradually over the project life.

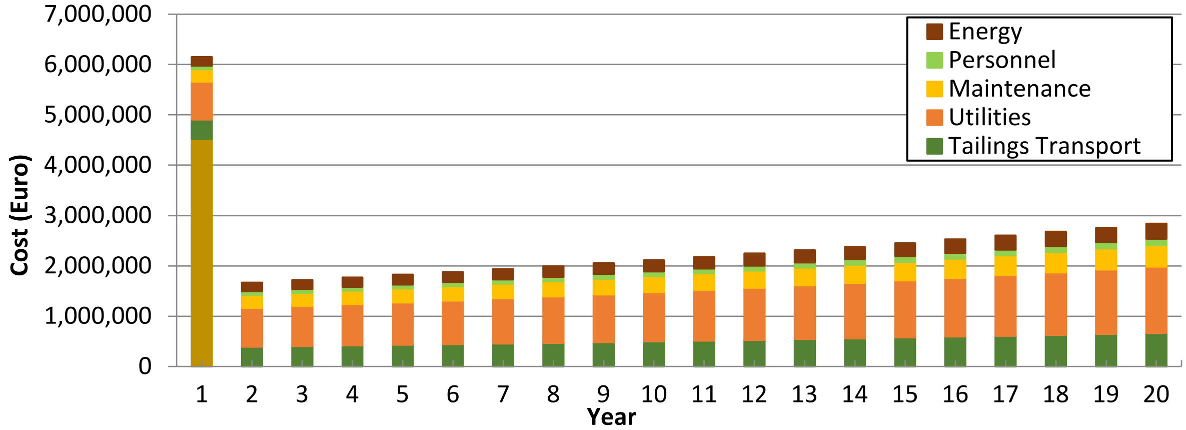


Figure 14 Annual total costs for pressure filter and dry stacking (water price = EUR 2)

4 Conclusion

Effective management of mine tailings, particularly in arid and semi-arid regions, represents one of the most critical challenges in the mining industry. Therefore, selecting an appropriate tailings management method requires a comprehensive approach that is not only technically and economically feasible but also environmentally and socially sustainable. Two of the most important tailings management methods include the use of paste thickener and tailings dam, and the use of filter press and dry stacking, were economically evaluated for a tailing dewatering and management unit with a capacity of 1 million tonnes per year, using the PWC method. The calculation of present worth is a financial process that converts all future cash inflows and outflows into their present value at the project's start time. Between 2 projects with the same lifespan, the more economical option is the one with the lower present worth of total costs.

The results of the economic evaluation indicate that water supply cost is the key determining factor in selecting an appropriate tailings management method. For the paste thickener and tailings dam option, even at low water prices, water supply constitutes the major portion of the total project cost. Consequently, this option is more sensitive to variations in water price. When the water price is below EUR 1.5/m³, the paste thickener with tailings dam is the more suitable choice due to its lower initial capital investment and lower energy consumption. However, at water prices above EUR 1.5/m³, the filter press with dry stacking option becomes more favourable because water consumption and related costs are significantly reduced. At water prices exceeding EUR 2/m³, the economic difference between the 2 options becomes substantial, and the filter press with dry stacking method is clearly the only economically viable alternative.

In the eastern and central regions of Iran, in addition to the scarcity of water resources, there are also spatial and topographical limitations for constructing tailings dams. Furthermore, due to the hot and dry climate in these areas that characterised by low precipitation and high evaporation rates, the combination of environmental constraints and regulatory requirements has made the filter press with dry stacking method the only appropriate tailings management solution. Over time, with the rising cost of water and the continued decline in available water resources, the necessity of using this method becomes even more evident. For instance, 2 copper concentrator plants mentioned in this study (Rangin Felez and Iju), which both belong to the same private owner, illustrate this trend. The tailings dewatering and management unit of the Rangin Felez Copper Concentrator, established in 2008, operates with a paste thickener and tailings dam. In contrast, the Iju copper mine, commissioned in 2021, despite having more favourable topographic conditions for dam construction, employs the filter press with dry stacking method for its tailings management system.

It is worth noting that, given the diversity of mine closure methods arising from varying geological, environmental, and operational conditions, a detailed discussion is beyond the scope of this study and the focus of this paper is on the significance and valuation of water.

Acknowledgement

The authors are sincerely grateful to Mr Ardeshiri, Mr Shahid Sales, and Dr Aghili for their insightful comments, valuable guidance, and continuous support throughout the course of this research.

References

Carneiro, A & Fourie, AB 2019, 'An integrated approach to cost comparisons of different tailings management options', in AJC Paterson, AB Fourie & D Reid (eds), *Paste 2019: Proceedings of the 22nd International Conference on Paste, Thickened and Filtered Tailings*, Australian Centre for Geomechanics, Perth, pp. 115–126, https://doi.org/10.36487/ACG_rep/1910_05_Carneiro

Davies, M, Lupo, J, Martin, T, McRoberts, E, Musse, M & Ritchie, D 2011, 'Dewatered tailings practice - Trends and observations', paper presented at the 14th International Conference on Tailings and Mine Waste, Vail.

Gomes, RB, Tomi, GD & Assis, PS 2016, 'Iron ore tailings dry stacking in Pau Branco mine, Brazil', *Journal of Materials Research and Technology*, vol. 5, no. 4, pp. 339–344.

Hahn, J & Dobler, T 2025, 'A case study showing the reduction of capex and opex by filtering fine and coarse fractions separately', in AB Fourie, A Copeland, V Daigle & C MacRobert (eds), *Paste 2025: Proceedings of the 27th International Conference on Paste, Thickened and Filtered Tailings*, Australian Centre for Geomechanics, Perth, pp. 399–412, https://doi.org/10.36487/ACG_repo/2555_28

Loftus, T 2025, 'Complexities of tailings management: emphasising comprehensive dewatering process design and optimisation', in AB Fourie, A Copeland, V Daigle & C MacRobert (eds), *Paste 2025: Proceedings of the 27th International Conference on Paste, Thickened and Filtered Tailings*, Australian Centre for Geomechanics, Perth, pp. 329–342, https://doi.org/10.36487/ACG_repo/2555_23

Maré, GS 2025, 'Innovation in tailings dewatering: case studies of the successful application of filter presses', in AB Fourie, A Copeland, V Daigle & C MacRobert (eds), *Paste 2025: Proceedings of the 27th International Conference on Paste, Thickened and Filtered Tailings*, Australian Centre for Geomechanics, Perth, pp. 121–130, https://doi.org/10.36487/ACG_repo/2555_07

Newnan, DG 2019, *Engineering Economic Analysis*, 14th edn, Oxford University Press, Oxford.

Phillips, Q & Taylor, M 2025, 'Techno-economical evaluation of dewatered stack tailings concept flow sheet options: a case study', in AB Fourie, A Copeland, V Daigle & C MacRobert (eds), *Paste 2025: Proceedings of the 27th International Conference on Paste, Thickened and Filtered Tailings*, Australian Centre for Geomechanics, Perth, pp. 381–398, https://doi.org/10.36487/ACG_repo/2555_27

Williams, R, Zink, D & O'Brien, S 2017, 'Filtered tailings adds value in cost competitive industries', in A Wu & R Jewell (eds), *Paste 2017: Proceedings of the 20th International Seminar on Paste and Thickened Tailings*, University of Science and Technology Beijing, Beijing, pp. 363–370, https://doi.org/10.36487/ACG_rep/1752_40_Williams