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ENVIRONMENTAL MONITORING ON LANDFILLS – FINANCIAL CHALLENGE FOR THE MUNICIPALITIES

PRAĆENJE STANJA OKOLIŠA NA ODLAGALIŠTIMA OTPADA – FINANCIJSKI IZAZOV ZA JEDINICE LOKALNE SAMOUPRAVE

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Legal Framework

Zakonski okvir

- **Concil Directive 1999/31/EC on the landfill of waste**
- **Concil Decision 2003/33/EC on establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 of and Annex II to Directive 1999/31/EC**
- **Waste Management Plan of the Republic of Croatia for 2017-2022 (OG 3/17)**
- **Act on Sustainable Waste Management (OG 94/13, 73/17)**
- **Ordinance on the methods and conditions for landfill, categories and operational requirements for landfills (OG 114/15)**
- **Ordinance on waste management (OG 23/14, 51/14, 121/15, 132/15)**

- **Environmental Protection Act (OG 80/13, 153/13, 78/15)**
- **Nature Protection Act (OG 80/13)**
- **Air Protection Act (OG 130/11, 47/14, 61/17)**
- **Water Protection Act (OG 153/09, 63/11, 130/11, 56/13, 14/14)**
- **Noise Protection Act (OG 30/09, 55/13, 153/13, 41/16)**
- **Regulation on Environmental permit (OG 8/14)**
- **Regulation on environmental impact assessment (OG 61/14, 3/17)**
- **Regulation on maximum noise level in inhabited areas and workplaces (OG 145/04)**
- **Ordinance on monitoring pollutant emissions from stationary sources into the air (OG 87/17)**
- **Ordinance on limit values in waste water (OG 80/13, 43/14, 27/15, 3/16)**

Existing conditions

Postojeće stanje

- **2016. – 130 active landfills**
- **Possible financial sources for:**
 - **Remediation and further operation – FOREIGN AND NATIONAL FINANCING**
 - **Remediation and closure – EU FUND**
- **The implementation of environmental monitoring is mandatory on active and closed landfills but it represents an unacceptable cost for financing from outer sources**
- **Environmental monitoring is defined by the legal framework which results with:**
 - **Environmental Permit** (Okolišna dozvola) - **for active landfills (which dispose more than 10 tonnes of waste per day or have a total capacity exceeding 25 000 tonnes)**
 - **Acceptance Document on Environmental Impact Assessment** (Rješenje o prihvatljivosti za okoliš) - **for small active landfills and for closed landfills**

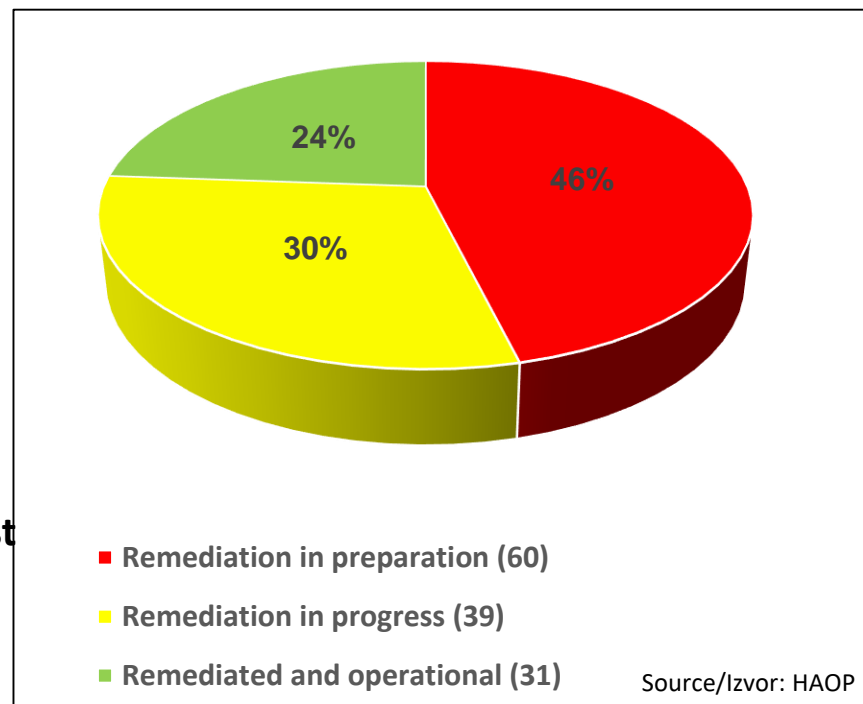


FIGURE 1. State of landfill remediation in 2016.
SLIKA 1. Status sanacije odlagališta u 2016.

Active Landfills

Aktivna odlagališta

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FIGURE 2. Remediated and active landfill Mraclinska Dubrava, Velika Gorica

SLIKA 2. Sanirano i aktivno odlagalište Mraclinska Dubrava, Velika Gorica

Closed Landfills

Zatvorena odlagališta

- There is no obligation and related costs of obtaining Environmental Permit and Waste Management Permit for the closed landfills
- There is an obligation for obtaining the Acceptance Document on Environmental Impact Assessment (Rješenje o prihvatljivosti za okoliš)
- The landfill Operator is obligated to conduct Environmental Monitoring Program for the period of 30 years after the closure of the landfill according to the Acceptance Document
- In addition to the monitoring costs, the Operator also has the costs of the landfill maintenance

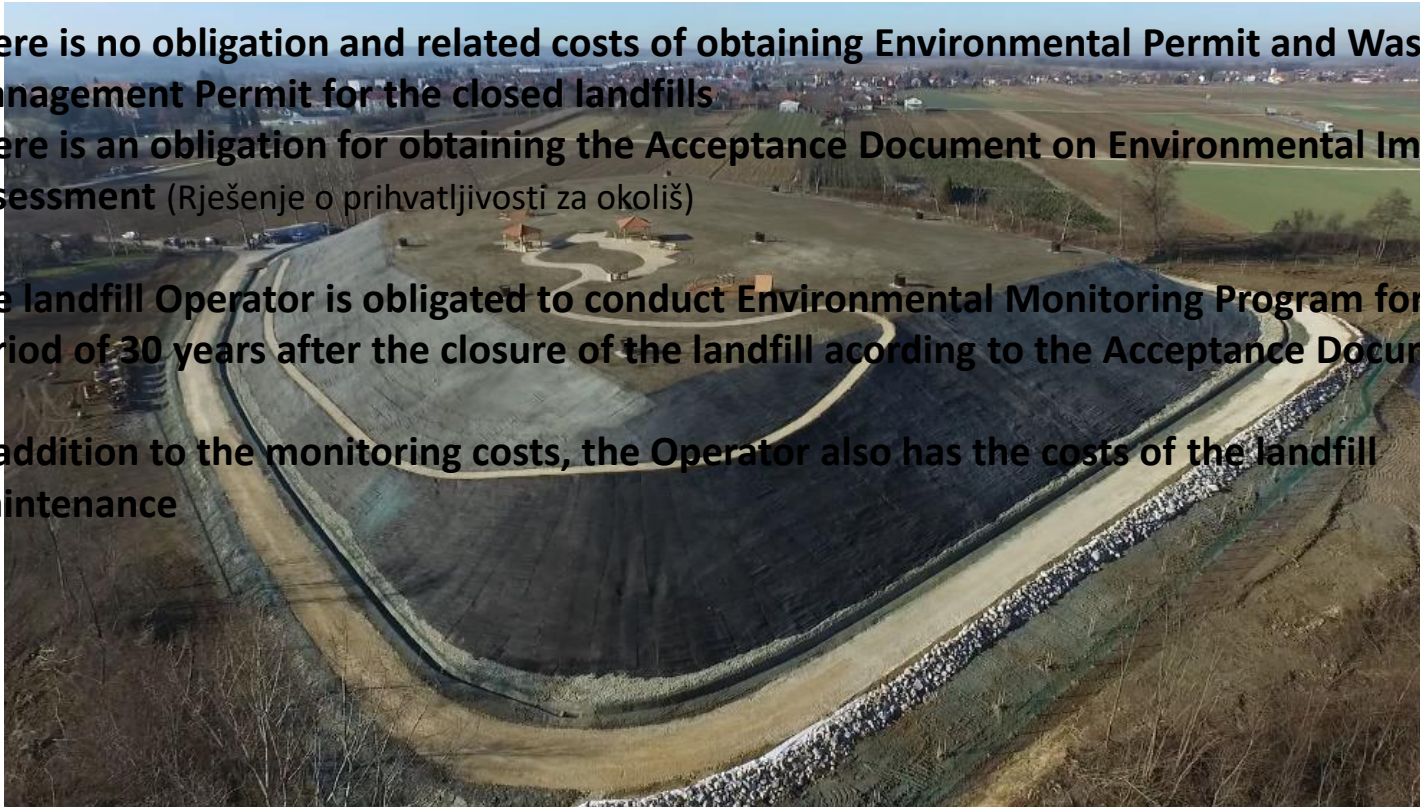


FIGURE 3. Remediated and closed landfill Meka, Ludbreg

SLIKA 3. Sanirano i zatvoreno odlagalište Meka, Ludbreg

Environmental Monitoring Program

Program praćenja stanja okoliša

TABLE 1. Mandatory Environmental Monitoring Program

TABLICA 1. Obvezujući Program praćenja stanja okoliša

Environmental Monitoring Program	Frequency	
	Operating phase	After-care phase (30y)
1. Meteorological data	daily	monthly
2. Landfill gas emission	monthly	every 6 months
3. Leachate composition, composition of storm water, volume and composition of surface water	quarterly	every 6 months
4. Level and composition of groundwater	every 6 months	every 6 months
5. Settling behaviour of the level of the landfill body	yearly	yearly

Source/Izvor: Annex IV, Ordinance on the methods and conditions for landfill, categories and operational requirements for landfills (OG 114/15)

Environmental Monitoring Program

Program praćenja stanja okoliša

TABLE 2. An overview of average annual monitoring costs for the landfill capacity 100.000 m³
 TABLICA 2. Pregled prosječnih godišnjih troškova monitoringa za odlagalište kapaciteta 100.000 m³

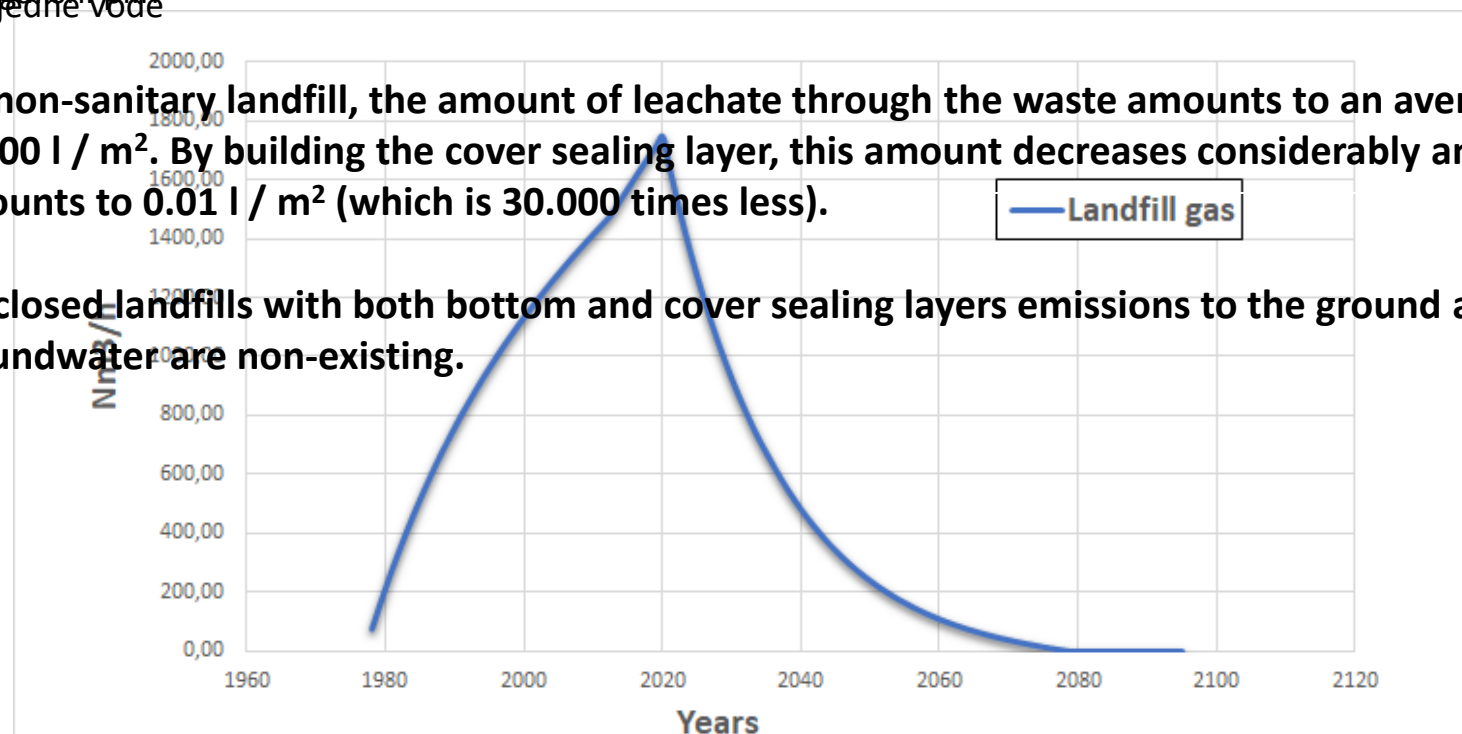
Environmental Monitoring Program	Total per year (HRK)	Total after 30 years (HRK)
Operating phase (Landfill gas emission (monthly), Leachate (quarterly), Stormwater (quarterly), Surface water (quarterly), Ground water (every 6 months), Settling of the landfill body (yearly))	122.000,00	
Aftercare phase (Landfill gas emission (every 6 months), Leachate (every 6 months), Stormwater (every 6 months), Surface water (every 6 months), Ground water (every 6 months), Settling of the landfill body (yearly))	50.000,00	1.500.000,00

The significance of emissions into the environment after the landfill closure

Značaj emisija u okoliš nakon zatvaranja odlagališta

➤ Landfill gas Odlagališni plin Procjene vode

- On non-sanitary landfill, the amount of leachate through the waste amounts to an average of $300 \text{ l} / \text{m}^2$. By building the cover sealing layer, this amount decreases considerably and amounts to $0.01 \text{ l} / \text{m}^2$ (which is 30.000 times less).
- On closed landfills with both bottom and cover sealing layers emissions to the ground and groundwater are non-existing.



Source/Izvor: Preliminary Techno-economic Analysis Determining the Potential of Utilizing Landfill Gas at a Landfill Diklo, MAXICON Ltd., 2016.

FIGURE 4. Production of landfill gas on landfill Diklo, Zadar
SLIKA 4. Proizvodnja odlagališnog plina na odlagalištu Diklo, Zadar

Conclusions

Zaključci

- **Almost all municipalities in the Republic of Croatia have a landfill, most of which are not sanitary.**

Gotovo sve općine u Republici Hrvatskoj imaju odlagalište otpada od kojih je velika većina odlagališta bila ne sanitarna.

- **The annual budget of some smaller municipalities amounts less than 3.500.000,00 HRK and monitoring costs can create a huge pressure on the municipal budget.**

Godišnji proračun nekih manjih općina iznosi manje od 3.500.000,00 HRK i troškovi monitoringa mogu stvoriti veliki pritisak na proračun tih općina.

- **The Project Designer is responsible for selecting design solutions that will later accumulate lower monitoring and maintenance costs when designing projects of landfill's remediation and closing**

Odgovornost projektanata je da prilikom projektiranja zahvata sanacije i zatvaranja odlagališta odabiru projektna rješenja koja su u skladu s pravilima struke, a će kasnije akumulirati niže troškove monitoringa i održavanja odlagališta.

Conclusions

Zaključci

THANK YOU FOR ATTENTION!

HVALA NA PAŽNJI!

- **Over the years following the closure of landfills there is a trend of declining levels of pollutants into the environment.**

Tijekom godina nakon zatvaranja odlagališta, trend je opadanja razina onečišćujućih tvari u okoliš.

- **The current legislative framework does not allow possibility of reducing measurement frequency of the parameters for closed landfills if they are below the prescribed limit values. Unlike the practice in Germany that has a system of criteria that when achieved landfill can be removed from a register.**

Trenutno važeći zakonodavni okvir ne dopušta mogućnost smanjenja učestalosti mjerenja parametara za zatvorena odlagališta ukoliko su ona ispod propisanih grančnih vrijednosti. Za razliku od prakse u Njemačkoj koja ima sustav kriterija koje kada odlagalište zadovolji može prestat s provođenjem monitoringa.

- **By adopting such practices, monitoring costs would be considerably reduced, which would have the greatest positive impact on small municipalities in which area there are also the smallest landfills.**

Usvajanjem takve prakse znatno bi se uštedjeli troškovi monitoringa, što bi se najviše pozitivno odrazilo na male općine na čijem području se u praksi nalaze i najmanja odlagališta.