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Environmental Crimes joint workshop with ESA-JRC-UNODC

SATELLITE MONITORING OF SAND AND GRAVEL EXTRACTION SITES, POTENTIAL PLACES OF ENVIRONMENTAL CONTAMINATION

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sand and gravel extraction



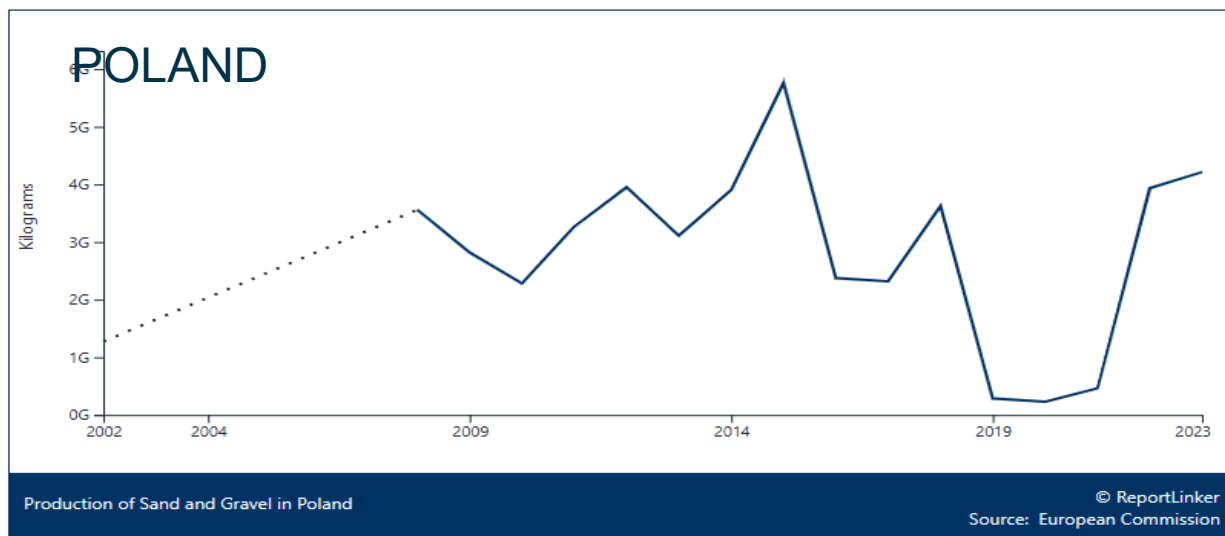
Sand and gravel are fundamental construction materials;

In Poland, 4 212 500 tons were extracted in 2023

/approximately **2 500 000 cubic metres**/

#	19 Countries	Kilograms	Last Year	YoY	5-years CAGR
1	 Poland	4,212,500,000	2023	+7.13%	+3.03%
2	Czechia	1,103,700,000	2023		
3	 Greece	1,021,800,000	2023	-3.43%	-5.6%
4	 Germany	801,390,000	2023	-23.52%	-2.26%
5	 Italy	750,530,000	2023	-13.42%	-24.35%

<https://www.reportlinker.com/>



Regulations on sand and gravel extraction in Poland

Extraction for own needs

only notification to the authority is needed

- limit: 10 m³ per year;
- extraction on one's own property;
- resale prohibited.

Commercial extraction - License is needed

- deposit documentation;
- technical design;
- environmental regulations;
- post-extraction reclamation plan;



<https://skladjakubiec.pl/produkty/materialy-budowlane/>



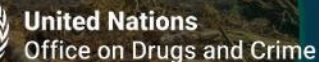
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unlicensed extraction

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The database is updated manually through the visual interpretation of aerial photographs



dumping of waste



30% of local illegal sand and gravel extraction sites are used for **illegal dumping**, including toxic waste.



<https://mazowiecka.policja.gov.pl/ra/aktualnosci/aktualnosci/78301,Przeste-pczy-proceder-nielegalnego-przewozenia-i-skladowania-niebezpiecznych-opda.html>



commercial extraction



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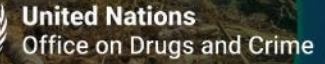


landscape of extraction sites

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life cycle of commercial extraction



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			SATELLITE DATA					
stage		scope of activities	S-2	VHR	HR / HS	UMV	AERIAL	HAPS
1	Deposit assessment	geological research, drilling						
		analysis of mineral quality						
2	Excavation design	deposit development plan						
		concession						
		site preparation						
3	Exploitation	removal of the top layer						
		extraction						
		sorting, transport						
		drainage						
4	End of mining	machine shutdown						
		dismantling of infrastructure						
5	Land reclamation	Site grading						
		soil restoration, plantings						
		tank forming						
6	Post-extraction	water quality monitoring						
		vegetation monitoring						

temporal resolution

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Digging the contents of a large truck in a farm field takes 15 min.



Sometimes the waste waits
a few days for digging.

Waste is dumped in pits and left uncovered.



water in the excavations monitoring using S-2



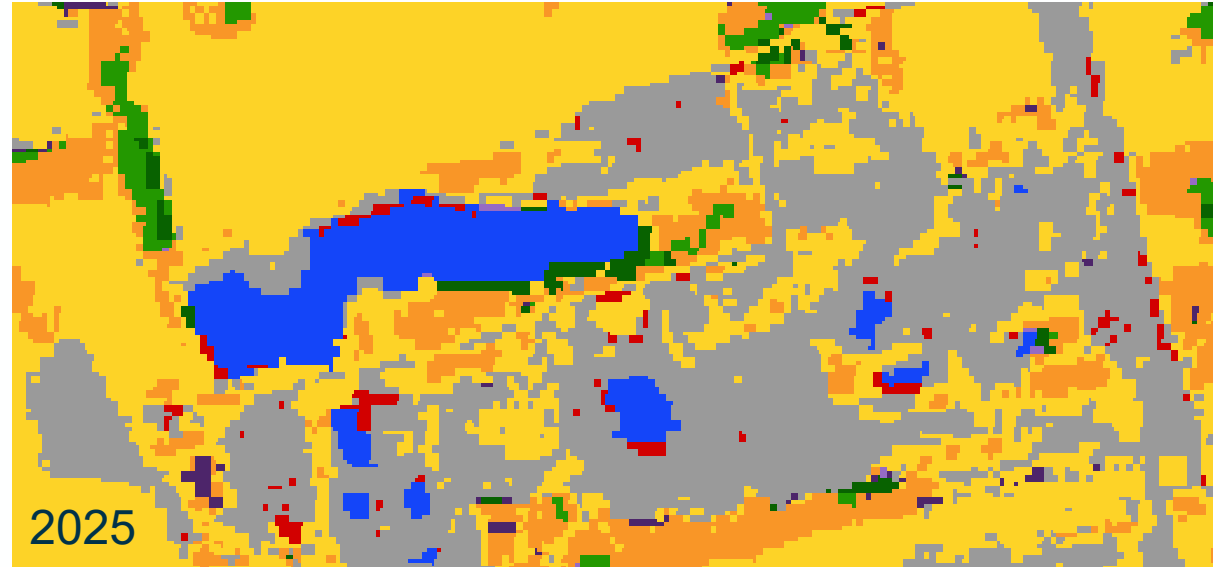
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Information on the presence of water in the excavations is important because potential contaminants may migrate into groundwater.



2025



2016



2025



Environmental police and local authorities are interested in information regarding the **location** and **time** of the crime, as well as the **materials** that were dumped.

what EO data can be used?

	TYPE OF EXTRACTION	
	Extraction for own needs	Commercial extraction
search area	unknown	known
EO data	VHR <i>MS / HS</i>	VHR <i>MS / HS</i>
		HR <i>MS / HS</i>
temporal resolution	in real-time systematic on-demand	



Fot. Piotr Skornicki / Agencja Wyborcza.pl

**only images showing the crime
can serve as evidence in court**



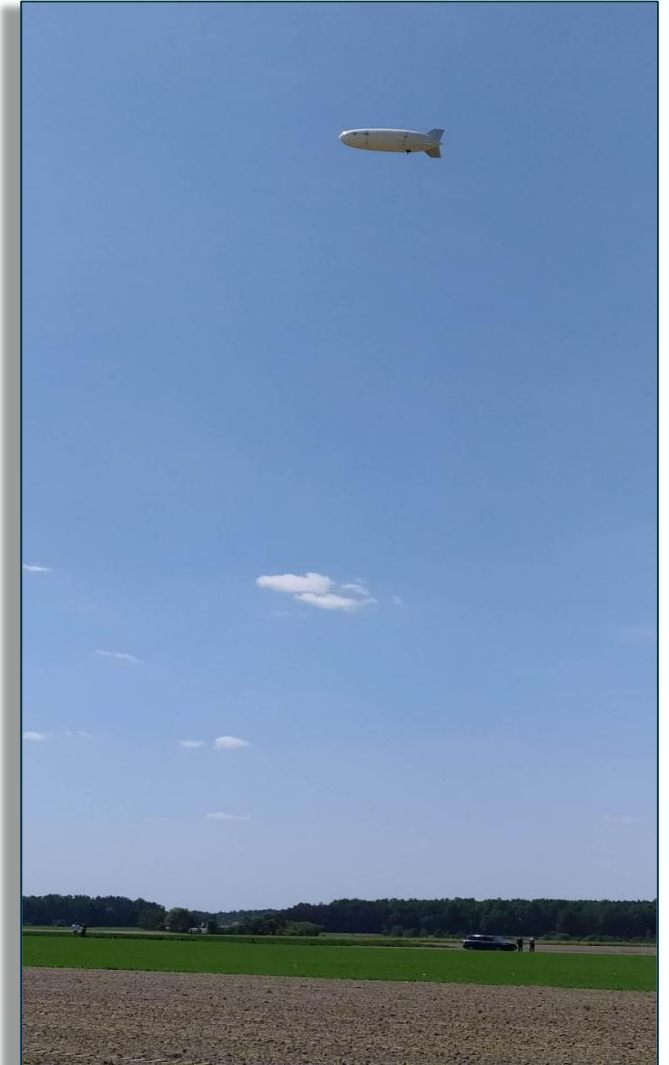
Sentinel-2 data allows for monitoring:

- spatial development of extraction sites;
- appearance and disappearance of water;

The scope for detecting environmental crimes is limited.

Environmental crimes require constant monitoring:

- constellation of VHR satellites
- **HAPs** (High-Altitude Platforms) operating at an altitude of 10–20 km

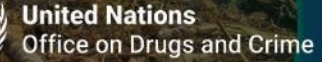


Support of ESRE grant

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The image displays eight logos of European aerospace research organizations arranged in two rows. The top row includes CBK PAN (a blue circle with 'CBK' and 'PAN' and a swoosh), CIRAC (stylized blue lines forming a 'C' with 'CIRAC' text and the Italian flag), DLR (a grey geometric star-like shape with 'DLR' text), and INCAS (a blue 'G' shape with 'INCAS' text and 'National Institute for Aerospace Research "Elio Carafoli"' below). The bottom row includes INTA (a blue circle with 'INTA' text and four dots), nlr (a blue logo with a rocket and the text 'nlr'), ONERA (the text 'ONERA' above a blue swoosh and 'THE FRENCH AEROSPACE LAB' below), and AEROSPACE (a blue wing-like shape with 'AEROSPACE' text).



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