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Environmental Crimes joint workshop with ESA-JRC-UNODC

Tackling Illegal Groundwater Drilling and Abstraction (TIGDA)

A stepped approach from Earth Observation detection to compliance
and enforcement

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Session 7 · Thursday 1 October 2026

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- **Groundwater levels**
declining trends, loss of quantitative status
- **Surface waters**
reduced baseflow, rivers and streams drying up
- **Ecosystems**
wetland and habitat stress, loss of dependent ecology
- **Land & quality**
subsidence, saline intrusion, pollution pathways

Source: TIGDA EO study, citing Fundación Botín (2020)

*“The abstraction of surface water or groundwater within the meaning of Directive 2000/60/EC, where such conduct causes or is likely to cause **substantial damage** to the ecological status or ecological potential of surface water bodies, or to the quantitative status of groundwater bodies.”*

Detection alone is not enough: authorities must link the activity to its environmental effect.

What TIGDA did (2021–2024)



From European practice, to field testing, to one guidance framework

16

questionnaire
respondents

10

European
countries

4

field
workshops

1

dedicated EO
technical study

Respondents: Belgium (Flanders), Croatia, Greece, Italy, Malta, Norway, Portugal, Romania, Slovenia, UK (England & Wales)



EO study: Prof. Radu Gogu (Technical University of Civil Engineering Bucharest) · Ion Nedelcu (Romanian Space Agency)



Four workshops, four lessons

 European Commission

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SLOVENIA · Oct 2023

Exemptions blur 'illegal' vs 'exempt'; drilling and abstraction can be permitted separately. Drone images admissible in court.



Free Copernicus & EGMS data plus open-source GIS are enough to launch a robust compliance campaign.

Common lesson: detection is only the beginning — the hard part is turning a signal into an enforceable case.



The TIGDA stepped approach

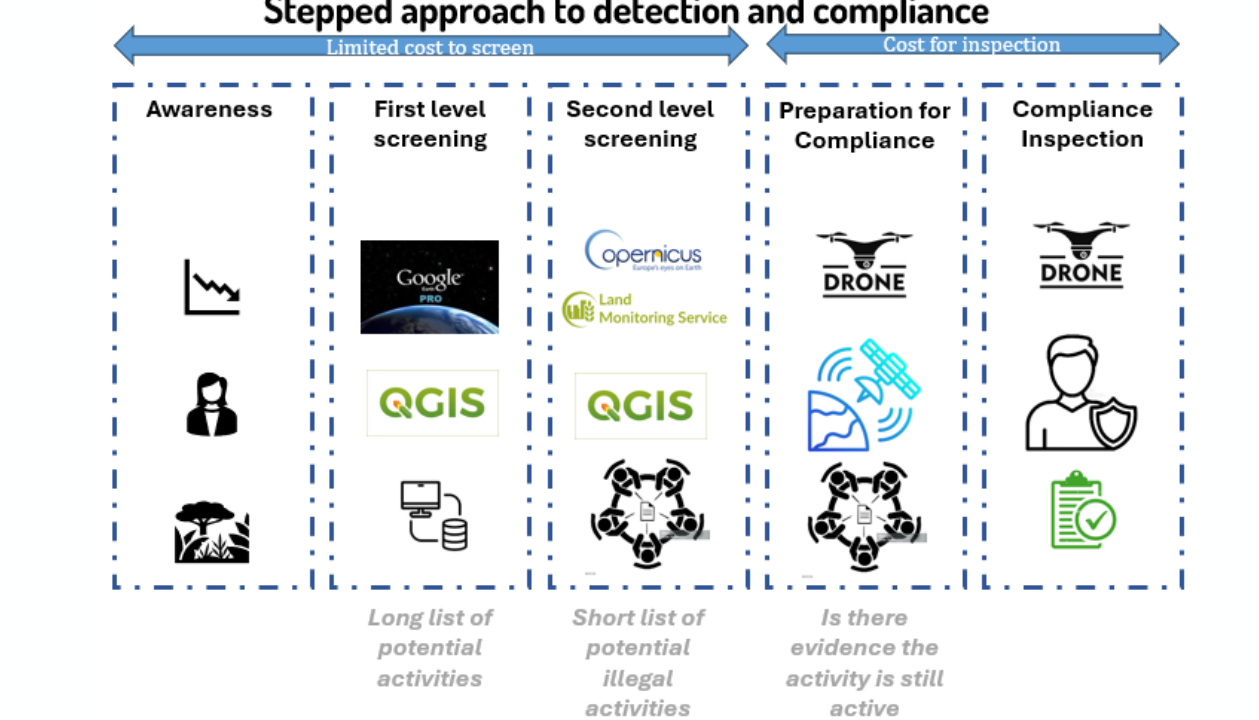
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Resource intensity increases only when the evidence and the risk justify escalation



1-3

4–5



Figure 3 – Stepped approach, IMPEL TIGDA Guidance · Below: the proportionate response (Figure 2)



A small expert team, a documented decision chain, and a standard checklist

EXPERT WORKING GROUP (steps 3–4)



Hydrogeologist

flow paths, receptors, likely harm



Compliance officer

permit or exempt? enforcement history



Data analyst

observations, permits, monitoring, EO



Case manager

process and audit trail for court

- + Legal and multi-agency partners when escalating to enforcement

BEFORE GOING ON SITE (step 4)

- Legal powers of entry and the legal entity to be served
- Which regulations are breached; enforcement-notice procedure
- Joint or multi-agency inspection (e.g. police powers)
- Equipment: drones, GPS, flow meters, evidential sampling kit
- Base controller takes the go / no-go decision



ON SITE: 12-part inspection checklist

Concealed wells and pipes · missing meters or seals · measured volumes · environmental effects · GPS-tagged photos · sealed samples and chain of custody

A low-cost starter kit

Resource-constrained authorities can start today with free data and open-source tools



Georeferenced permits

Even a spreadsheet with grid coordinates is enough to start



Open-source GIS (QGIS)

Overlay permits, incidents, receptors and monitoring points



Free EO imagery

Copernicus Sentinel, Landsat, Google Earth for change and irrigation



EGMS ground motion

European Ground Motion Service: free InSAR data to flag subsidence



Cross-referencing

Automated: detected activity with no matching permit = a lead



Drones — where authorised

High-resolution verification and live inspection support

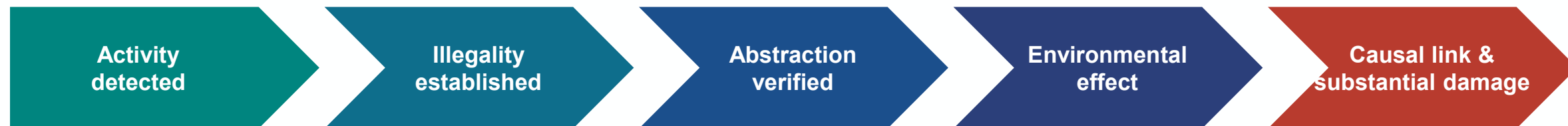


Buy specialist, recent processing only for the short list.

From detection to damage



Under the ECD, proving the abstraction is only the first link in the chain



EVIDENCE LAYERS

	EO time series	extent, persistence and change of irrigated areas, ground motion
	Groundwater monitoring	levels and trends; deviation from thresholds and reference conditions
	Hydrogeology	flow paths, receptors, water balance, reduction of reserves
	Dependent ecosystems	baseflow, wetlands, saline intrusion, subsidence
	Field & legal evidence	well, pump, volumes, operator, permits, chain of custody

NEXT PHASE

TIGDA + IMPEL GIEDA

Geospatial Intelligence for Environmental Damage Assessment

Strengthen the evidential link between a detected groundwater activity and the Directive's substantial-damage threshold.

The diagram consists of four vertical panels, each representing a step in a process. The panels are colored light blue, light green, light blue, and light green from left to right. Each panel contains a circular icon at the top, a title in bold capital letters, and a descriptive text block.

- IMPLEMENT**: Icon of a graduation cap. Description: Train-the-trainer sessions with IMPEL KIP across Member States (Azores, July 2026).
- INTEGRATE**: Icon of three interlocking gears. Description: Test promising EO methods with current users; embed EO, GIS and permit data in inspection planning.
- CLARIFY**: Icon of an open book. Description: With the 4N group: definitions of illegal groundwater activity and legislative drivers across the EU.
- EVIDENCE**: Icon of a balance scale. Description: With GIEDA: guidance on when abstraction causes, or is likely to cause, substantial damage.

Three take-home messages

01

A satellite signal is a starting point — not an enforcement outcome.

02

EO creates most value when integrated with permits, GIS, inspection and field evidence.

03

The stepped approach is a proportionate path from a signal on a screen to regulatory — and, where appropriate, criminal — enforcement.

“The question is no longer whether we can see illegal groundwater activity from space — but how we turn what we see into action and defensible evidence.”

Thank you

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Report
2022(VI)WG
2 and
guidance:
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