“Substantial” damage in the context of the ECD
Environmental Crimes $ Water crimes

The fourth major area of international crime (after drugs, counterfeiting and human trafficking)
Challenge: What is the meaning of damage...

**Dictionary**
- Harm
- Loss

**ELD**
A measurable adverse change in a natural resource or measurable impairment of a natural resource service which may occur directly or indirectly.

**Water damage (under ELD)**
Any damage that significantly adversely affects the *Status* under WFD.

**ECD**
*Substantial damage (linked to offenses)*

**Risk assessment methodologies**
Harm or loss resulting from the exposure of a given receptor to a given hazard, in a given spatial and temporal reference.

**Technical-scientific index for the clarification of illicit actions on water resources (I_{tc})**

**Aim:** Deepen the concept of “damage”
What is the mean of “substantial damage”? 

Working group within National IMPEL Network:

- APA (Environment Agency)
- IGAMAOT (Inspection)
- Public Prosecution Service
- Criminal Police

Acknowledgement: ICNF (Nature & Forest Conservation Institute)
Butterfly effect
Common language to avoid legal/technical misinterpretations

01. Adverse effect

Impairment of the quality of water resources, aquatic ecosystems or the current uses or services provided by water bodies.

02. Significant adverse effect

Adverse effect resulting from an unacceptable outcome for surface water and/or groundwater resources, which may/should result in significant damage to them.

03. Occurrence or hazardous event

An abnormal act of limited duration, which may occur once or periodically and has an adverse effect on water resources.

04. Result of the occurrence in the receiving environment

The effective result on water resources of a given occurrence or hazardous event that has arisen in a given space and time reference, as measured by the $I_{tc}$. 
Technical-Scientific Index of illicit for water resources (I_{tc})

**01 OCCURRENCE POTENTIAL**
Measures what happen (or is happening): Exclusively linked with the intrinsic characteristics of the occurrence or hazardous event

**02 NEGATIVE EFFECT**
It relates to the severity of the effect and its continuity over time (integrates the temporal dimension)

**03 POTENTIAL FOR WATER RESOURCES BEING AFFECTED**
Includes the susceptibility of surface and groundwater resources to pollution

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**METHODOLOGY**

1. A methodology to determine the magnitude of damage (numerical value)
2. A methodology that allows to observes the "whole" broken down by the various factors and establishes the respective relationship to determine the magnitude of the damage
3. A methodology that translates "substantial" to a math value

\[
I_{tc} = \frac{P_{\text{occurrence}} \times \text{Effect}_{\text{neg}} \times P_{\text{affecting WR (SW or GW)}}}{9^{n-1}}
\]

- **9^{n-1}** — Normalization factor
- **n** — n.⁹ of terms in the equation that can have max rank (i.e., value of 9)
Scientific support: Probability vs Reality

0 < Probability ≤ 1

Probability of occurrence ≤ 1
Probability of damage ≤ 1
Very low to very high risk of damage

Probability = 1

Probability of occurrence = 1
Probability of damage = 1
Real damage level from very low to very high

Risk characterisation methods can be employed provided that the likelihood of an occurrence/event is equal to one (1).

Prediction of match score after the game is over!
Technical-Scientific Index of illicit for water resources (Itc)

### Occurrence potential
- Waste/chemical disposal, spills, leakages...
- Wastewater discharges (chemical & microbiological parameters)
- Occurrences near groundwater abstraction

### Negative effect
- Type of occurrence
  - Continuous over time
  - Discontinuous in time
  - Punctual event
- Severity
  - Mortality (quantity & quality)
  - Water quality deterioration
  - Impairment of uses or ecosystem services

### Potential for water resources being affected
- Surface water
- Groundwater
- Vulnerability to pollution
- Sensitivity of aquatic environment
- Protected areas
- Distance to water (streams, flooding areas, abstractions, dams...)

### Additional factors:
- Status of the affected water body(ies) & direct effect on parameters that support the water status
- Recurrence of violations / non-compliance of previous notifications

- Use of importance scale (3 to 9) to each factor
- Math relations between factors
- Matrixes between factors/relations
- Prioritization of results in importance scale (3 to 9)
- Measuring significance by qualitatively comparing the importance of each factor in relation to the reference situation (considered in the absence of occurrence)
- Incorporation of a comparative analysis between the reference situation and the situation after the occurrence
Methodology Validation

- **Inspection body**
  - **Ruggedness tests**
    - Application to cases under investigation (or for investigation)

- **Environmental Agency**
  - **Confidence tests**
    - Application to real situations to distinguish between administrative infractions and possible prosecution for criminal offenses
Determination of the magnitude of damage

Tools developed:

01. GIS tool (geovisualizer)
02. Assessment in situ
03. Collection of evidence
04. Factors classification
05. Index determination

Results assessment

- $I_{tc} \geq 4$
- $I_{tc} < 4$

Roadmap/checklist: To help evidence collection on field & assessment/desktop studies

To assess the water resources susceptibility to pollution
Guidance document

ÍNDICE TÉCNICO-CIENTÍFICO: ESCLARECIMENTO DO ILÍCITO SOBRE OS RECURSOS HÍDRICOS

TECHNICAL-SCIENTIFIC INDEX FOR THE CLARIFICATION OF ILICIT ACTIONS ON WATER RESOURCES

- Officially approved by APA & IGAMAOT (4th May 2023)
- Public document
- Versions in PT and EN
Training & Capacity building

Environment agency
- Competences in control and enforcement
- 5 Regional departments

Inspection
- National body with environmental inspection competences

Criminal police bodies
- Several bodies in PT (PSP/GNR/PJ)
- Marine police
- Coverage of all territory

Public Prosecution Service
- Presentation of methodology, its principles, validation methods and the tools developed
Final remarks

Methodology supported in technical-scientific approaches (Risk assessment basis: Probability of occurrence equals to 1 means that math equations allows to measure its respective effects)

Definition of criteria & respective measure/magnitude of damage (translates “substantial” to a math value in a scale from 3 to 9)

Metric scale that allows to distinguish cases that should follow an administrative penalty or a possible criminal offense

Addresses any type of action that could jeopardizes water resources (wastewater discharges, chemical spills, waste disposal…) and allows to integrate cumulative effects on surface and groundwater

Validation by the Inspection and Environment Agency on real cases (possible “water crimes”)

Intends to allow a quicker and easier assessment by the inspection/police/officers promoting a better and holistic approach to support reports for prosecutors (several tools were developed)

Several training sessions were already promoted
Water is the beginning of everything!
Tales de Mileto