

apa
portuguese
environment
agency



“Substantial” damage in the context of the ECD

Anabela Rebelo, PhD

Water Resources Department

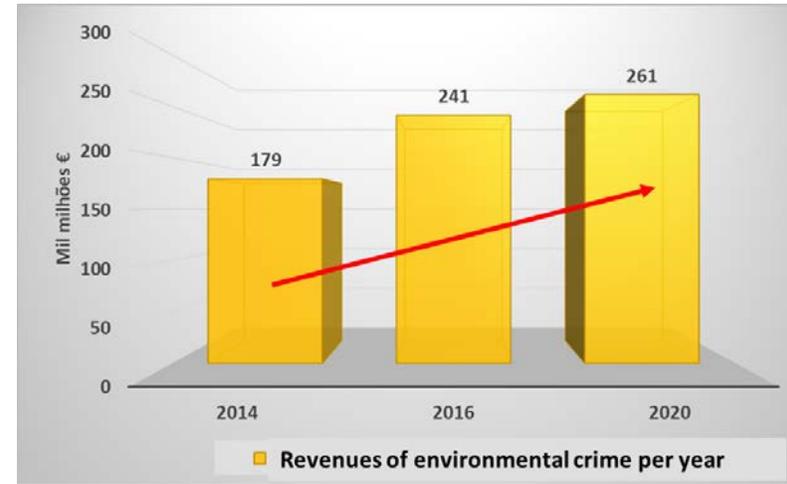
anabela.rebelo@apambiente.pt



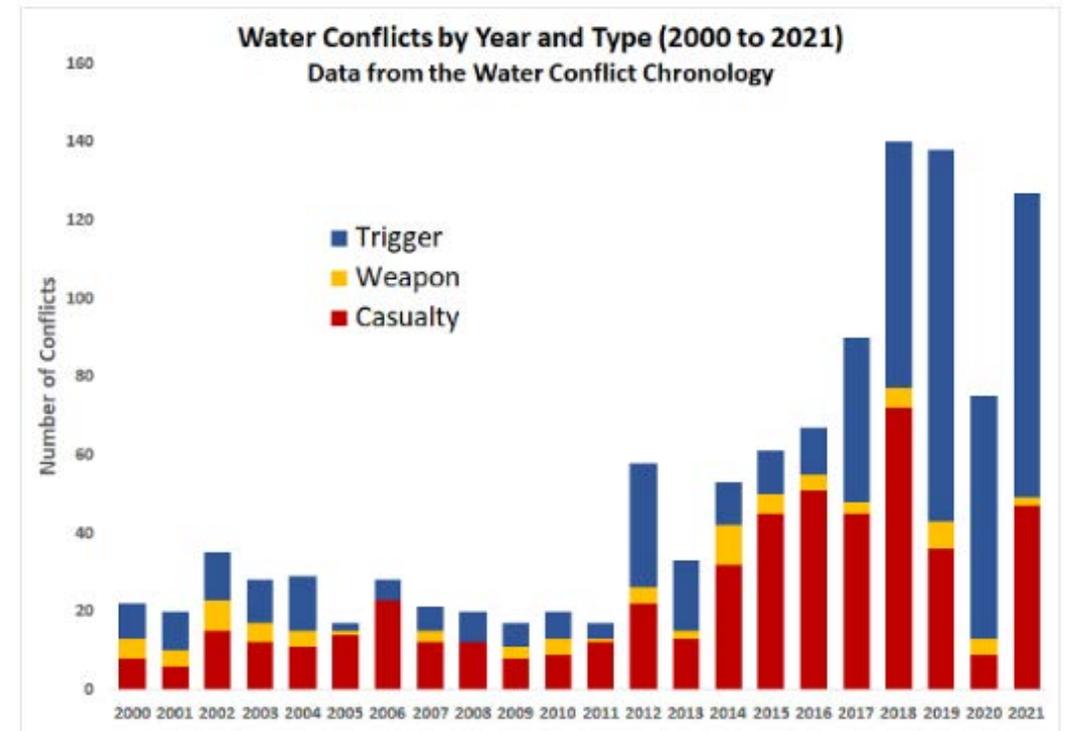
**REPÚBLICA
PORTUGUESA**

ENVIRONMENT AND
CLIMATE ACTION

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

ECD

Substantial damage (linked to offenses)

ELD

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

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

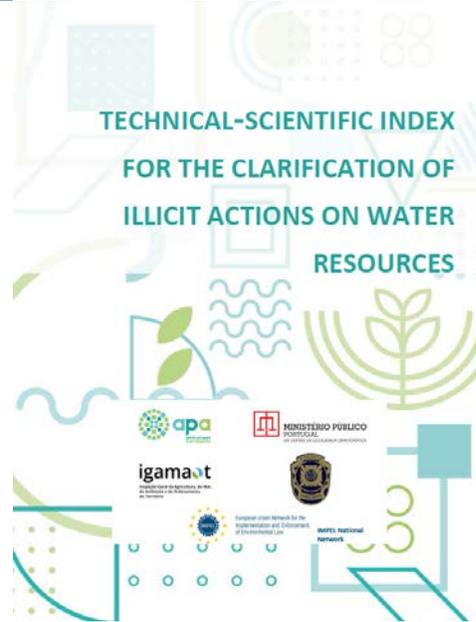
Water damage (under ELD)

Any damage that significantly adversely affects the *Status* under WFD

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" ?



Which approach...



what?

why?

how?

Working group within National IMPEL Network:

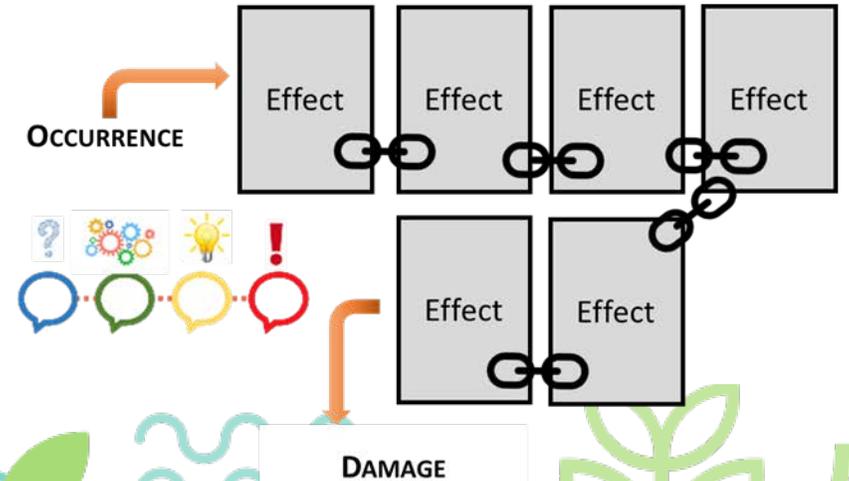
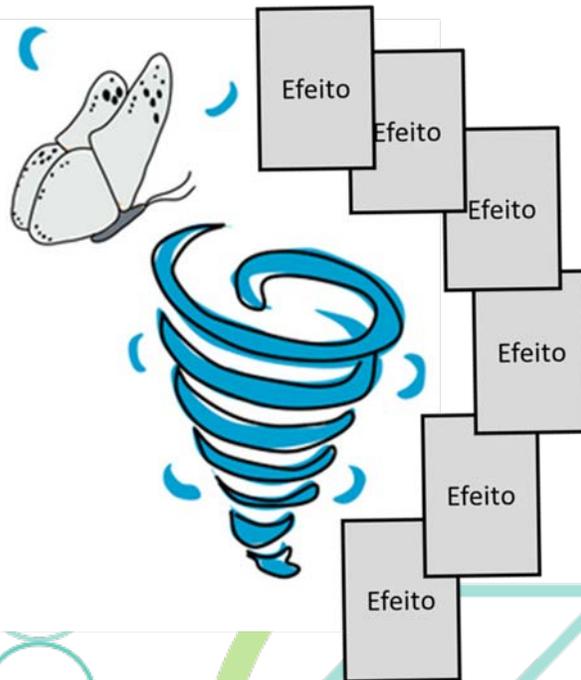
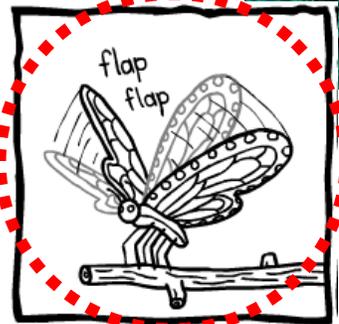
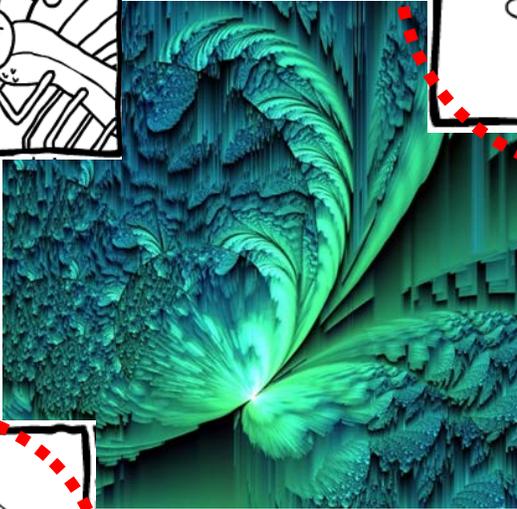
- APA (Environment Agency)
- IGAMAOT (Inspection)
- Public Prosecution Service
- Criminal Police



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



	f_{RHS} sup ou sub			
	Nível 1	Nível 2	Nível 3	Nível 4
Zonas não classificadas	3	5	5	5
Áreas de influência de zona sensível	5	5	7	7
Zonas sensíveis critério c	5	7	7	9
Zonas sensíveis critério a	5	7	9	9



Wastewater discharges	Level
ELV < [Parameter] ≤ ELV	3
2xELV < [Parameter] ≤ 3xELV	5
3xELV < [Parameter] ≤ 4xELV	7
[Parameter] > 4xELV	9

$$Severity_{WR\ SW\ or\ GW} = \frac{\sum f_{SevSW\ or\ GW_i}}{n_{f_{SevWR\ SW\ or\ GW}}}$$

METHODOLOGY

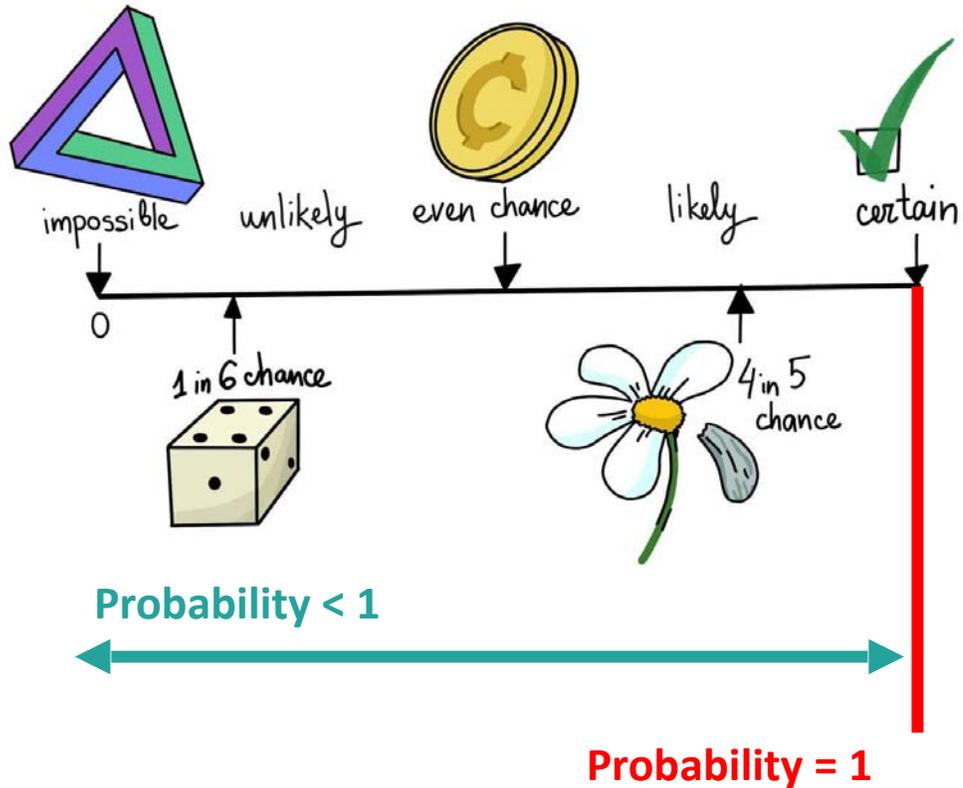
1. A methodology to determine the magnitude of damage (numerical value)
2. A methodology that allows to observe the "whole" broken down by the various factors and establishes the respective relationship to determine the magnitude of the damage
3. A methodology that translates "substantial" to a math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

$$I_{tc} = \frac{P_{occurrence} \times Effect_{neg} \times P_{affecting\ WR\ (SW\ or\ GW)}}{g^{n-1}}$$

g^{n-1} – Normalization factor

n – n.º of terms in the equation that can have max rank (i.e., value of 9)

Scientific support: Probability vs Reality



Probabilistic assessment

Probability of occurrence ≤ 1

Probability of damage ≤ 1

Very low to very high risk of damage

Assessment of a real occurrence

Probability of occurrence = 1

Probability of damage = 1

Real damage level from very low to very high

$0 < \text{Probability} \leq 1$

Probability = 1
"Prediction of match score"
 after the game is over!

RISK CHARACTERISATION METHODS CAN BE EMPLOYED PROVIDED THAT THE LIKELIHOOD OF AN OCCURRENCE/EVENT IS EQUAL TO ONE (1).

Technical-Scientific Index of illicit for water resources (I tc)

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

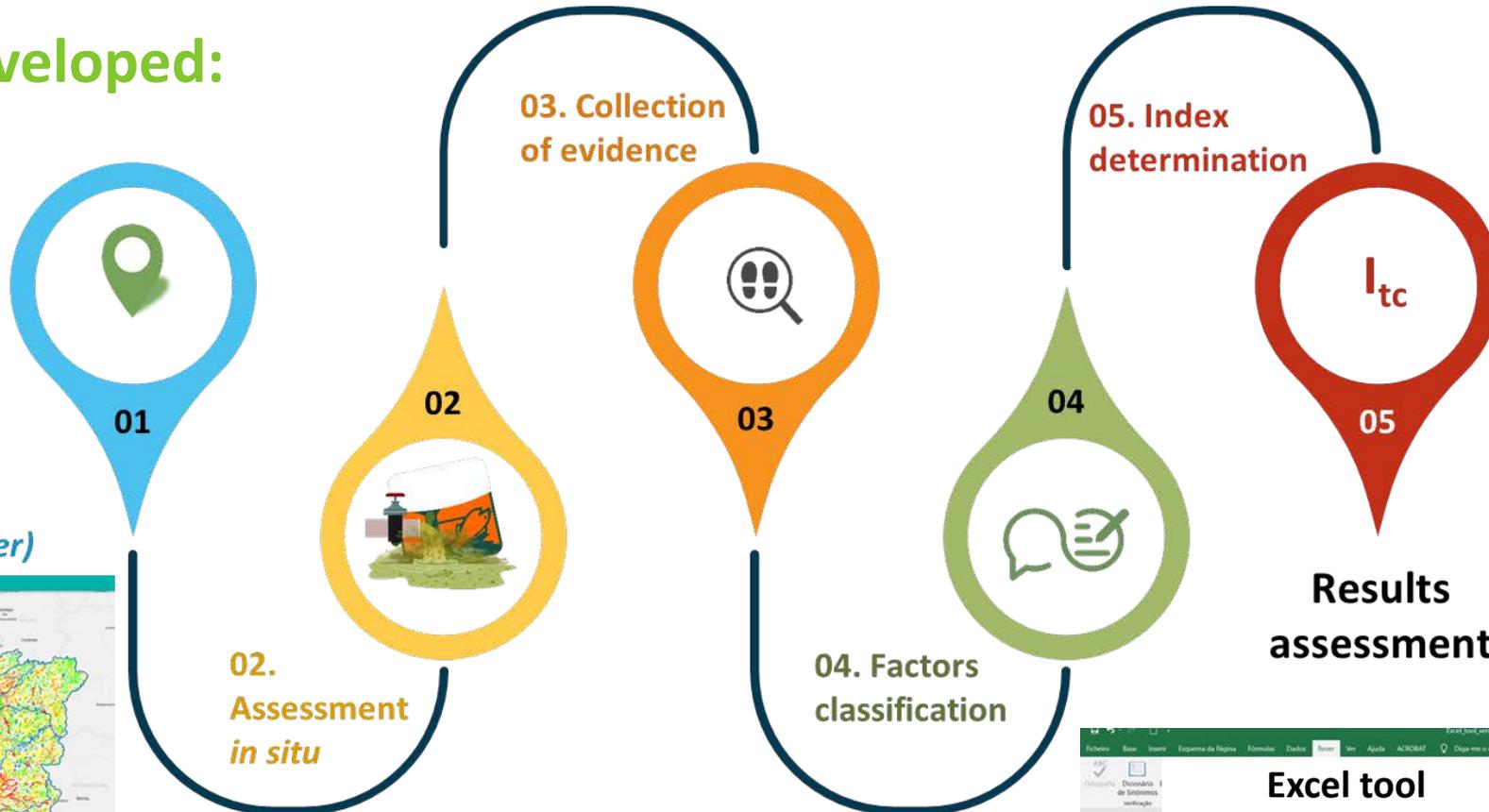
- Use of importance scale (3 to 9) to each factor
- Math relations between factors
- Matrixes between factors/relations
- Priorization of results in importance scale (3 to 9)
- Measuring significance by qualitatively comparing the importance of each factor in relation to the reference situation (considered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

Methodology Validation

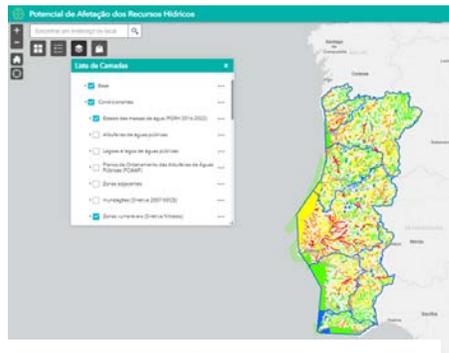


Determination of the magnitude of damage

Tools developed:



1. GIS tool (geovisualizer)



To assess the water resources susceptibility to pollution



02. Assessment in situ

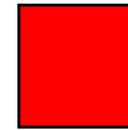
Roadmap/check-list: To help evidence collection on field & assessment/desktop studies

Avaliação do local e envolvimento da zona de ocorrência ou evento perigosos			
Descrição Zonas		Critério de pesquisa (esquema B1)	
1	Tipologia de zonas		
1A	É zona de proteção de habitats e da fauna e flora selvagens e a conservação das aves selvagens e naturais	<input type="checkbox"/> Sim, responder a 1A1 <input type="checkbox"/> Não	Geovisualizador ou na área temática "Condicionantes", no tema "Áreas protegidas" e geovisualizador do ICM (parques e parques)
1A1	É zona de Proteção Especial (ZPE)	<input type="checkbox"/> Sim, responder a 1A2 <input type="checkbox"/> Não, responder a 1A2	
1A2	É zona de parque natural	<input type="checkbox"/> Sim, responder a 1A3 <input type="checkbox"/> Não, voltar a 1A	
1A3	É zona de pré-parque natural	<input type="checkbox"/> Sim, responder a 1A4 <input type="checkbox"/> Não, voltar a 1A	
1B	É zona sensível	<input type="checkbox"/> Sim, responder a 1B1 <input type="checkbox"/> Não	Geovisualizador ou na área temática "Condicionantes", no tema "Zonas sensíveis (DAR)"
1B1	É zona sensível critério a.	<input type="checkbox"/> Sim, responder a 1B2 <input type="checkbox"/> Não	
1B2	É zona sensível critério b.	<input type="checkbox"/> Sim, responder a 1B3 <input type="checkbox"/> Não, voltar a 1B	
1C	É zona vulnerável à poluição por nitratos	<input type="checkbox"/> Sim, responder a 1C1 <input type="checkbox"/> Não	Geovisualizador ou na área temática "Condicionantes", no tema "Zonas vulneráveis (Diretiva Nitratos)"
1D	É zona de infiltração máxima	<input type="checkbox"/> Sim, responder a 1D1 <input type="checkbox"/> Não	Geovisualizador ou até à sua disponibilidade terá de ser questionado à APA-ARH territorialmente competente

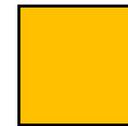
Excel tool

Recursos Hídricos Superficiais		Recursos Hídricos Subterrâneos		Recursos Hídricos Superficiais e Subterrâneos (efeitos cumulativos)	
Índice	Valor	Índice	Valor	Índice	Valor
Assimilabilidade	7	Assimilabilidade	5	Assimilabilidade	6
Disponibilidade	9	Disponibilidade	9	Disponibilidade	9
Qualidade	3	Qualidade	3	Qualidade	3
Extensão	7	Extensão	7	Extensão	7
Condições de uso	2	Condições de uso	2	Condições de uso	2
Total	28	Total	26	Total	26
Fator adicional	Classificar Esp. 1, Não/Não	Fator adicional	Classificar Esp. 1, Não/Não	Fator adicional	Classificar Esp. 1, Não/Não
Estado da massa de água	0	Estado da massa de água	0	Estado da massa de água	0
Os parâmetros analíticos foram analisados com que frequência e classificação	0	Os parâmetros analíticos foram analisados com que frequência e classificação	0	Os parâmetros analíticos foram analisados com que frequência e classificação	0
Estado da massa de água tem ou superior e quantidade de efeitos negativos ou absence estes recursos hídricos (sup ou sub)	1	Estado da massa de água tem ou superior e quantidade de efeitos negativos ou absence estes recursos hídricos (sup ou sub)	0	Estado da massa de água tem ou superior e quantidade de efeitos negativos ou absence estes recursos hídricos (sup ou sub)	0
Recorridos de utilização da Recarga em situações de seca	0	Recorridos de utilização da Recarga em situações de seca	0	Recorridos de utilização da Recarga em situações de seca	0
O utilizador não implementou na realidade ou parcialmente medidas preventivas ou outras medidas de mitigação para administração em consequência de anteriores derrames ou não respostas a crises estabelecidas	0	O utilizador não implementou na realidade ou parcialmente medidas preventivas ou outras medidas de mitigação para administração em consequência de anteriores derrames ou não respostas a crises estabelecidas	0	O utilizador não implementou na realidade ou parcialmente medidas preventivas ou outras medidas de mitigação para administração em consequência de anteriores derrames ou não respostas a crises estabelecidas	0
Total	10,00	Total	2,63	Total	12,63

Results assessment



$$I_{tc} \geq 4$$



$$I_{tc} < 4$$



Guidance document



- Officially approved by APA & IGAMAOT (4th May 2023)
- Public document
- Versions in PT and EN
- <https://apambiente.pt/agua/indice-tecnico-cientifico-esclarecimento-do-ilicito-sobre-os-recursos-hidricos>



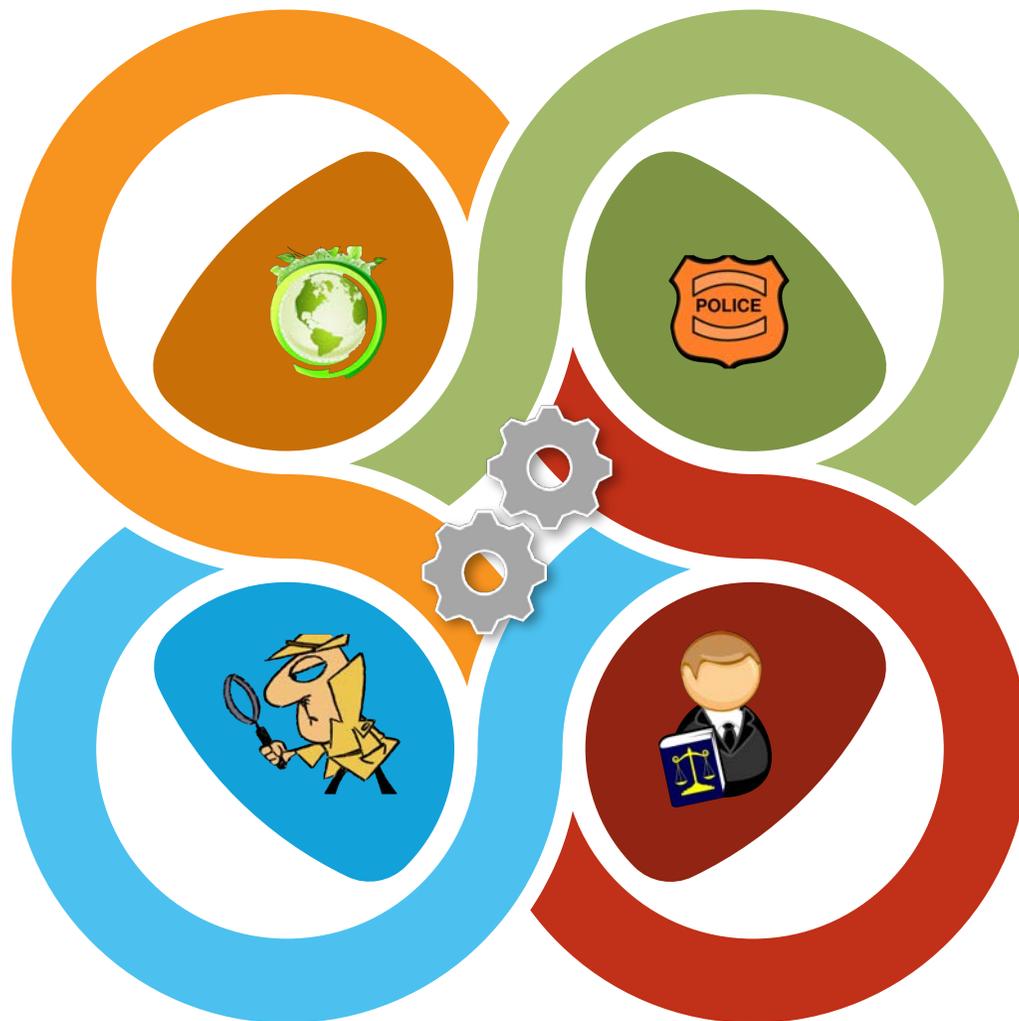
Training & Capacity building

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

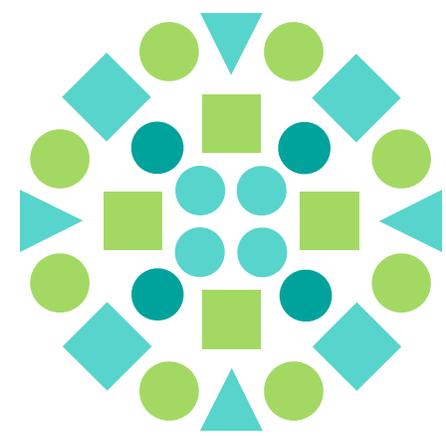
Validation by the Inspection and Environment Agency on real cases (possible “water crimes”)

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)

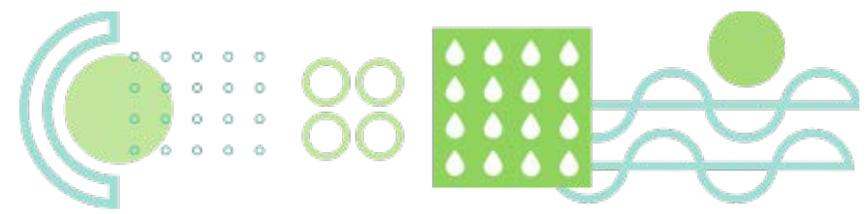
Several training sessions were already promoted



Water is the beginning of everything!
Tales de Mileto



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