

MINATURA
2020

Mineral Deposits of Public Importance



Funded by the
European Union

A Algorithmic Approach: the proposal of the Portuguese team

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Brussels, 10th November 2017

The Reasoning Behind the MDoPI Classification and Mapping

- Let us denote the available geological information for each “site” (from critical outcrops to mineral resources differently evaluated) as *LGK*.
- The past, on-going or foreseen exploitation could be assessed by means of a set of criteria pondering equally the economic (*Ec*), environmental (*Ev*) and social (*SDA*) dimensions.
- Therefore, a general ranking can be established by means of:

$$MDoPI_r = n LGK + m(Ec + Ev + SDA)$$

- The empirical parameters *n* and *m* are debatable, but considering that the fundamental feature is the “safeguarding for future access/use” of a mineral resource, **the *LGK* should be the prevailing factor**; thus, $n > m$. Furthermore, scaling the range for a maximum value of 10 and assuming $n = 5.5$, the resulting *m* equals 1.5. This means that in an ideal case where each factor is one (*i.e.* $LGK = Ec = Ev = SDA = 1$) the relative weight of the economic (*Ec*), environmental (*Ev*) and social (*SDA*) dimensions is 4.5:

$$MDoPI_r = 5.5 + 4.5 = 10$$

which seems reasonable in comparison with the 5.5 weight of *LGK*.

MDoPI definition

Level of Geological Knowledge

$$LGK = \sum_{i=1}^4 (k_i G_i) QDA$$

Economic Dimension

$$Ec = \sum_{j=1}^5 (k_j Ec_j) QDA$$

Environmental Dimension

$$Ev = \sum_{l=1}^7 (k_l Ev_l) QDA$$

Social Development & Acceptance

$$SDA = \sum_{w=1}^5 (k_w SDA_w) QDA$$

$$\mathbf{MDoPI}_r = 5.5 LGK + 1.5(Ec + Ev + SDA)$$

QDA (Qualitative Data Assessment):

1.00 ← Complete and reliable

0.00 ← No data available to support a credible assessment

MDoPI categorization

$$MDoPI_r = 5.5 \sum_{i=1}^4 (G_i k_i) QDA + 1.5 \left(\sum_{j=1}^5 (Ec_j k_j) QDA + \sum_{l=1}^7 (Ev_l k_l) QDA + \sum_{w=1}^5 (SDA_w k_w) QDA \right)$$

1 – Lack of enough geological knowledge to support the limitation of any specific tract

2

3

4

5

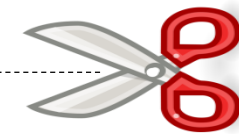
6

7

8

9

10 – Specific tracts hosting active and well-succeeded exploitations triggering high social development and low environmental impacts, deserving strong public acceptance



Where to place the threshold ?

Could be ≥ 4
(consequences?)

Tungsten Simple kriging MDOPIr | Portugal Specific Tracts (1360)

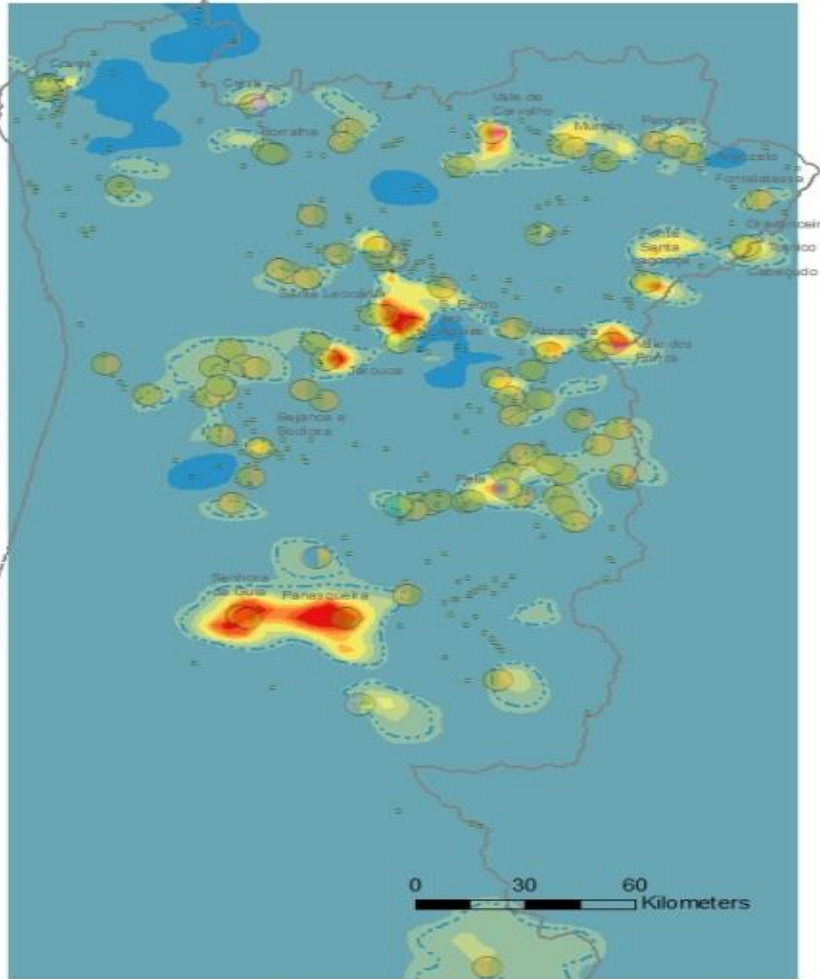
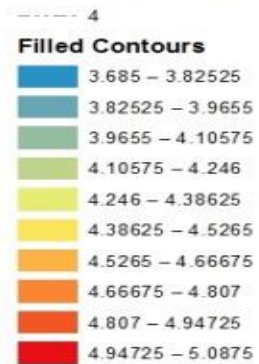


Substâncias

- | | | | |
|--|-------|--|-------|
| | AuAgW | | WAsAu |
| | AuW | | WAuAg |
| | BeW | | WBe |
| | PbAuW | | WMo |
| | PbWSn | | WQz |
| | SbWAu | | WSbAu |
| | Sn | | WSn |
| | SnTaW | | WSnAg |
| | SnW | | WSnBe |
| | SnWTi | | WSnCu |
| | USnW | | WSnF |
| | UW | | WU |
| | W | | WAs |

Kriging W

Prediction Map
Contour MDOPIr 4



MDOPIr_W

- 3.69 - 3.99
- 4.00 - 5.09

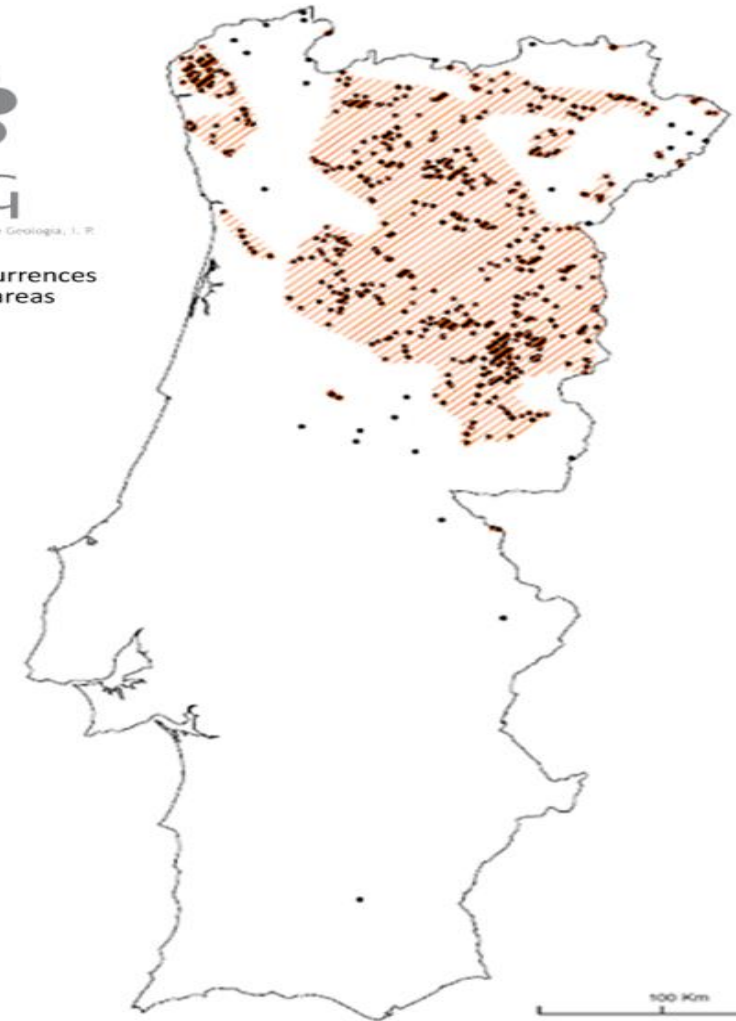
Data Information	MDOPIr > 4	Percent of MDOPIr > 4 covering Continental Portugal
Total Mining Site Areas	1360	7.81%



LNEG

Laboratório Nacional de Energia e Geologia, I. P.

Tungsten - Tin occurrences
and potential areas



Major risks involved in the application of the MDOPI algorithm

- **High variability of some criteria and sometimes their subjective characteristics**, in particular those depending on “market factors” (e.g. volatility of prices) or on “circumstantial political features” that are inherent to *Ec* and *SDA* dimensions.

Thus:

- **Available databases** are often outdated, doubtful and may be insufficient for land management/planning purposes. **A regular, thorough revision of the *MDoPI_r* scores considering up to date information should be ensured; in this respect, a triennial upgrading of MDoPI maps is highly recommended, assuming that databases will be subjected to continuous improvements.** Results will be derived in land
- **The way how the algorithm is applied** is not properly informed and generalised distribution of the algorithm cannot be guaranteed. **Well-grounded studies about “public opinion” should also be promoted since they are a key-issue to ensure an objective appraisal of some criteria in *SDA* dimension.** Simple but, if conditions for a *MDoPI_r* application (and further refinement) of the *MDoPI_r* algorithm should be a matter of permanent concern of a committed and multidisciplinary-skilled team strongly connected with the group of experts responsible for the systematic upgrading of databases.