MINISTRY OF EDUCATION, RESEARCH, DEVELOPMENT AND YOUTH OF THE SLOVAK REPUBLIC

VER 2026

Periodic Assessment of Research, Development, Artistic and Other Creative Activities VER 2026

Final Report of the Metallurgy, Mining and Materials Science Sub-panel

The subpanel members have carefully reviewed the submitted material and adhered to the legal guidelines of the Periodic Evaluation of Research, Development, Artistic and Other Creative Activities (VER2026) particularly following the Directive [1] as well as the Statute of the Assessment Sub-Panels [2] as outlined on the ministerial webpage. After having read all submitted material, both the scientific works as well as the social impact studies, we would like to start this report by congratulating the academic colleagues for the overall very high quality of the submitted material and the tremendous effort, which became apparent during the review.

A clear strength of the scientific reports was the thoroughness and attention to details in setting up the experimental design and carrying out the experimental analyses. This, paired with comprehensive reviews of the existing literature lays the groundwork for solid assumptions and is something that often falls short in the wider academic „publish-or-perish“ society, which follows quantity rather than the high level of quality that is demonstrated here. The research topics cover the full spectrum of the sub-panel's topics – metallurgy, materials and mining – and encompasses the first ever characterisation of novel substances and assessment of resources and conditions which are of national importance in terms of resource availability, emissions as well as their potential (environmental) impact on the wider society in the Slovak Republic. The social impact studies reveal clearly that many of these research activities were carried out with limited or no access to expensive equipment and could therefore largely be classified as mid-TRL research, effectively bridging

the gap between research on the atomic or molecular level and industrial application. What is more is that the social impact case studies demonstrate a healthy mix of academics of various levels of academic seniority and gender, which is good.

Despite the clear strengths of the submitted outputs, it becomes apparent that a significant shortfall to the academic impact is that the vast majority of the work is published in either conference papers or OpenSource publishers with (at that time) questionable reputation. It is assumed that this is largely because of the long publishing times, that the academics have chosen to submit their works to these journals which publish quickly and without a thorough review. Considering that most of the work is of good academic quality and the fact that these publishers do have significant costs for publishing and, even more for OpenAccess, means that this amounts to a considerable burden for universities to cover these publication fees, which would otherwise be brought to better use.

Additionally, the sub-panel members also wonder whether matrix effects have been studied at all in the chemical analyses, since most samples are of a complex nature but such potential effects on the obtained results were not discussed in the scientific reports.

Looking forward and considering the content of the submitted material, the sub-panel members would like to encourage the academic colleagues to consider the following points for further future improvements in their research, which are listed in alphabetical order:

- Data availability is made upon request. For wider impact and networking with academic partners, consider sharing via EU-wide platforms such as the European Open Science Cloud or offering nonconfidential data and algorithms via a university or public repository.

- Equality and diversity is not only represented by gender (male/female) and academic level of seniority but several other characteristics such as age, language and religious belief, as long as these are officially recognised by national and/or European law. Additional inclusivity may further consider the success stories of students to e.g. provide evidence for jobs created in the social impact studies.
- Modelling techniques are scarce which is both an opportunity for cost-efficient innovation (e.g. digital „what-if “scenarios) as well as increasing the acceptance rate in scientific publishing through cross-verification of the independent modelling and experimental techniques. The statistical fundamentals can therefore be reduced since these are nowadays established.
- OpenSource programmes are readily available for many relevant cases on data visualisation and analysis, which should come at no extra costs, as long as these are used for non-commercial purpose. This would also allow to link with current modelling activities which focus on the use of AI and

Sub-Panel Feedback on VER2026 Submissions data analytics. For the submitted material, a good use would be machine learning methods both for regression (trend analysis) as well as classification (geological or environmental impact).

- Publishing should become a recognised stage/task in academic grants. Scientific publishing should not just be an „inconvenience “to address swiftly but rather the time requirements of the reviewing process should be considered as an integral part of the research plan. Outreach via public talks and workshops should be considered for wider (national) dissemination as well.

For consistency in the assessment process, we further include the qualitative descriptors which our subpanel applied during the evaluation process. The total ranking of an article is

based on the average of the ranking in the below three categories – originality, significance and rigour.

Table: Qualitative Assessment Criteria, used in this evaluation by the sub-panel.

	Originality	Significance	Rigour
World Leading	First-ever presentation of new data, material or method	Output addresses a significant societal problem or presenting a significant conceptual advance to existing literature.	Very thorough and logical approach, solid statements and conclusions which are fully supported by the presented results.
Internationally Excellent	Some advances of presented data, material or methods of high academic standard but not firstever.	Output addresses a national or industrial sector problem or presenting some conceptual advances to existing literature.	Thorough and logical approach, statements are sound but not always fully supported by presented results.
Internationally Recognised	Thorough presentation of data, material or a method. Small and incremental improvements.	Output addresses a regional or rare problem or discussing existing conceptual approaches from literature.	Logical approach, good but partially incomplete literature review. Main conclusions are supported by results but some gaps between literature and results emerge which are not addressed.
Nationally Recognised	Data, material or method presented is based on pre-existing knowledge. Some small errors and/or inconsistencies in the approach or quality of data, material or method.	Output addresses a local societal problem or presenting a single-case challenge. Some discussion of conceptual approaches from literature but no thorough discussion.	Some inconsistencies in the logical structure and conclusions, small errors or no recognition of previous works in the field.
Below the Standard of Nationally Recognised work	Case study, based purely on preexisting knowledge, containing numerous errors and/or inconsistencies.	Output addresses a purely academic societal problem with questionable basis. Conceptual approaches from literature contain errors, inconsistencies in the discussion.	Gaps in the literature. Results do not fully support the conclusions, some gaps or missing references to pre-existing work in the field.

References

[1] Directive No.03/2025 on the Periodic Assessment of Research, Development, Artistic and Other Creative Activities, URL: https://www.minedu.sk/data/att/6b6/34550.21cf64.docx (accessed 15th December 2025).

[2] Statute of Assessment Sub-Panels and Main Assessment Panels of the Periodic Assessment of Research, Development, Artistic and Other Creative Activities, URL: https://www.minedu.sk/data/att/b5f/34039.f32a75.pdf (accessed 15th December 2025).

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