technopolis group

March 2021

International Evaluation of Scientific Institutions' Activity

Consolidated report

Erik Arnold, Paula Knee, Anete Vingre

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1 Introduction

This report summarises the International Evaluation of Scientific Institutions' Activity undertaken for the Ministry of Education and Science of the Republic of Latvia. The organisation of the evaluation was contracted to the Technopolis Group and was undertaken by six panels of scientific peer reviewers. Each panel has produced a detailed report, together covering 63 research units. The evaluation started in late 2019 and was completed in early 2021. It covered the research activities of Latvian institutions from 1 January 2013 to 31 December 2018.

The international evaluation was directed at institutions included in the Register of Scientific Institutions. Evaluation was compulsory for all state funded scientific institutions, while private scientific institutions could participate on voluntary basis.

The evaluation covered 37[1] institutions. Since several institutions consist of multiple units, the evaluation covered 63 research units. Table 1 illustrates the distribution of units across science fields.

Table 1 Number of research units in each science field

Field	**Number of units**
Natural Sciences	7
Medical and Health Sciences	8
Agriculture, Forestry and Veterinary Sciences	5
Social Sciences	16
Humanities and Arts	11
Engineering and Technology	16

This report summarises the evaluation method, the scores across the six panels, and the panels' observations. The report then discusses policy implications and lists recommendations for future policy and evaluations.

[1] Initially the number was 38, but one private institution decided to withdraw from the evaluation.

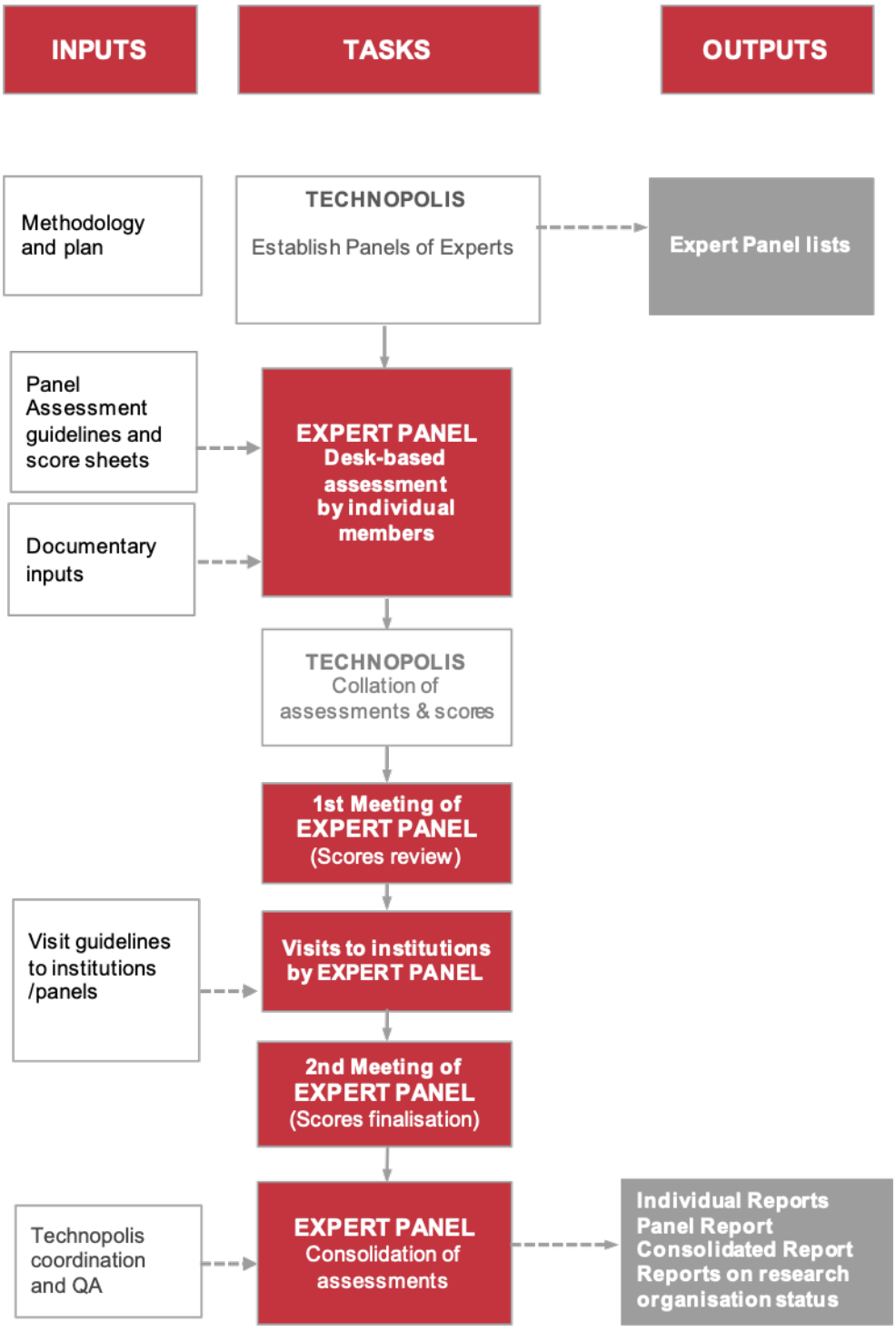
2 Summary of the Process

The international evaluation method is informed peer review of Latvian research institutions by panels of international experts. The purpose of the international evaluation is to evaluate the Latvian institutions against international standards of scientific performance, impact and infrastructure. A detailed list of assessment criteria is presented in the Appendix A Assessment criteria. Peer assessment is based on documentary evidence, a review of selected research outputs and institutional visits.

The international evaluation started with establishment of Expert Panels and preparation of documentary inputs for their work. This resulted in Expert Panel lists and background information for panels to review. This was followed by desk-based assessment performed by individual members of panels. The next step of the process was the first Expert Panel meeting to agree on initial assessments and scores. Following the meeting, Expert Panels (virtually) visited units, then the Expert Panels met again to agree on final assessments and scores. The process was completed by producing Individual Reports that were presented to the units. After receiving feedback from units about any factual errors, Expert Panels prepared Panel Reports.

The international evaluation process is presented in Figure 1.

Figure 1 Evaluation Process



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2.1 Panel membership

To conduct the evaluation, 38 experts were selected and recruited to serve as peer reviewers in six Panels covering Medical and Health sciences, Humanities and Arts, Engineering and Technology, Social Sciences, Agriculture, Forestry and Veterinary science and Natural Sciences. All Panel Members were recruited according to the criteria defined in the Regulation on Procedures for Organising the International Evaluation of Scientific Institutions Activity[2] (the Regulation). Evaluated units were informed about the Panel membership and approved the panellists. Panel membership was adjusted few times due to the changes in the evaluation schedule caused by the Covid-19 pandemic. All changes were approved by the units.

In addition to the criteria defined in the Regulation, we aimed to ensure diverse geographical representation as well as gender balance. To ensure continuity and some comparability, four Panels were chaired by experts who acted as chairs in the Latvian Research Assessment Exercise in 2013 (RAE 2013). The other two Panels were chaired by experts who were Panel members in the 2013 assessment. Besides the chair, all Panels had at least one other member from RAE 2013. This helped Panels to perform some general assessment of the progress achieved, which is discussed in more detail in section 4.

2.2 Panel tasks

The documentary inputs to the international evaluation were the Methodology Document that guided the process, the units' self-assessment reports and selected research publications, general background information and bibliometric analyses. These were provided to the Panel Members. Based on the documentary review, the Panel provided an initial assessment and initial scores for each institution against the assessment criteria.

The Panel Members met in the first Panel Meeting to review and moderate the initial scores and make any necessary adjustments. Following the meeting, the Panel Members (virtually) visited the units. After the visits the Panel Members attended the second Panel Meeting to review the initial assessment and scores in light of the visits and make any final adjustments. After the visits to units, the Expert Panel prepared Individual Reports that were sent to the units for feedback on any factual errors. After receiving feedback, the Panel prepared the final version of the Panel Report.

2.3 Site and virtual visits

The Panel Members visited all relevant units. Due to the travel restrictions caused by the Covid-19 pandemic only the Medical and Health Sciences Panel physically visited the units in Latvia. All other Panels held remote Panel meetings and institutional visits. In both formats the Panels met with researchers and research managers/senior staff, cooperation partners and PhD students of the units. In many cases units invited sectoral (line) ministry, other governmental agencies and industries.

The institutional visits covered the following topics:

- Interviews/group discussion with senior institution/university staff, faculty staff and leaders
- Interviews with representatives of sectoral (line) ministries or industry
- Interviews with doctoral students

[2] Republic of Latvia Cabinet Regulation No. 619. 2018. Procedures for Organising the International Evaluation of Scientific Institution Activity. Available at: https://likumi.lv/ta/en/en/id/301995-procedures-for-organising-theinternational-evaluation-of-scientific-institution-activity

To compensate for the lack of a physical tour of the facilities, Technopolis provided a filming service before the visit. This allowed the units to prepare short videos to show the research infrastructure. The videos were shared with Panel Members before the virtual visits.

3 Summary of scores

This section provides an overview of overall scores and scores for each criterion assigned by the six Panels. The Panels followed the score definitions provided in the methodology of the evaluation. In addition, a senior member of the Technopolis team attended Panel Meetings to act as moderator to ensure consistency across the Panels. The evaluation was performed in terms of international standards for research quality and the assigned scores should be interpreted in this light.

Figures below show mean scores and distribution of scores across Panels. Following Panel abbreviations are used in the figures:

Panel A – Agriculture, Forestry and Veterinary Sciences
Panel E – Engineering and Technology
Panel H – Humanities and Arts
Panel M – Medical and Health Sciences
Panel N – Natural Sciences
Panel S – Social Sciences

Figure 2 shows the mean scores provided for each criterion and per discipline (covered by each Panel). Social Sciences and Engineering and Technology were assigned the lowest scores across almost all evaluation criteria. Engineering and Technology scored better in economic impact. Medical and Health Sciences evaluated the performance of the Institute of Organic Synthesis as outstanding on all evaluation criteria.

Figure 2 Mean scores per discipline

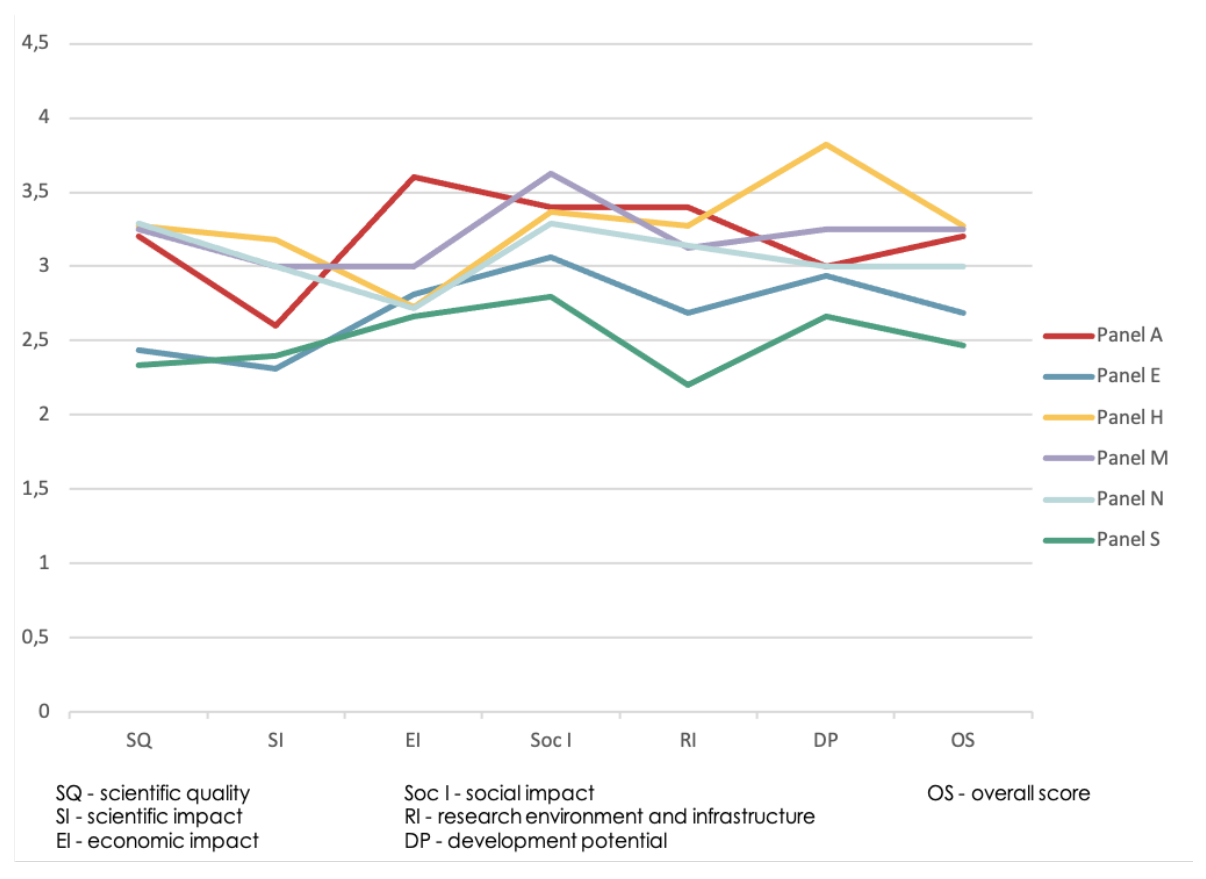


Figure 3 illustrates the distribution of overall scores. Two units were assigned the highest overall score of 5, indicating outstanding level of research: The Institute of Organic Synthesis in Medical and Health Sciences and the Institute of Literature, Folklore and Art of the University of Latvia in Humanities and Arts. The most common overall score was 3 with the exception of Humanities and Arts and Agriculture, Forestry and Veterinary Sciences where an overall score of 4 was also awarded as often as a 3. In Engineering and Technology an overall score of 2 was awarded as often as a 3. Overall scores illustrate that in general units perform a good level of research, there are significant high points of excellence in some fields, and units delivering adequate or even poor research can be identified in all fields.

Units with overall scores of 4 and 5 are listed in Appendix A: across the six Panels there are 16 such units, which is 25% of all evaluated units. As evident in Appendix B, units with overall scores of 4 and 5 never score below 3 on the criteria of quality of research and impact on the discipline.

Figure 3 Distribution of overall scores

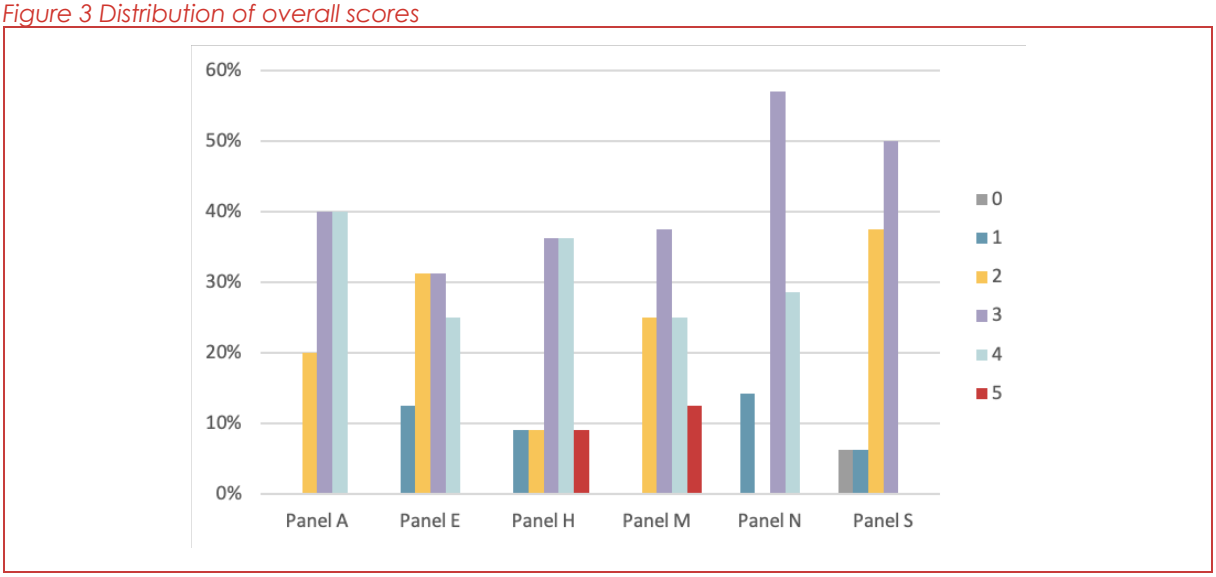


Figure 4 shows the distribution of scores for quality of research. Only the Institute of Organic Synthesis scored 5 on this criterion. Most units scored 3 on this criterion, indicating a good quality of research and being strong national players with some international recognition. 35% of units scored 1 or 2, indicating poor or adequate levels of research with no – or a very limited – international publication record.

Figure 4 Distribution of scores: Quality of research

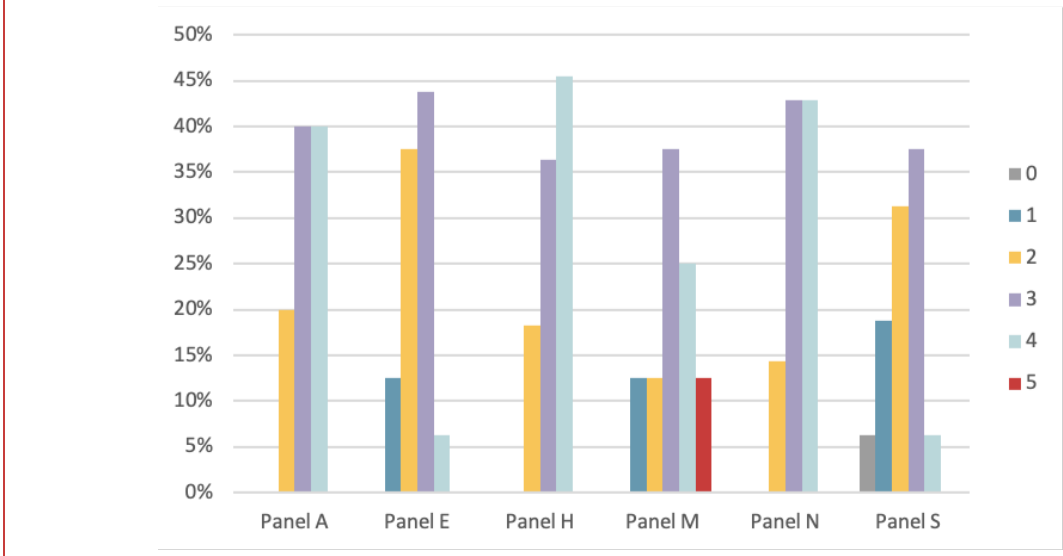


Figure 5 illustrates the scores assigned for the impact on the discipline. As with quality of research, the most common score for impact on the discipline is 3, indicating a good impact. However, this criterion has a higher percentage of scores 1 and 2 (42%) meaning these units still have to strive to establish themselves in the international arena. Social Sciences stand out in a negative way, with 50% of units scoring 2, while Humanities and Arts score 4 for 45% of units. Across all Panels, 12 units scored 4 and one (again, the Institute of Organic Synthesis) scored 5.

Figure 5 Distribution of scores: Impact on the discipline

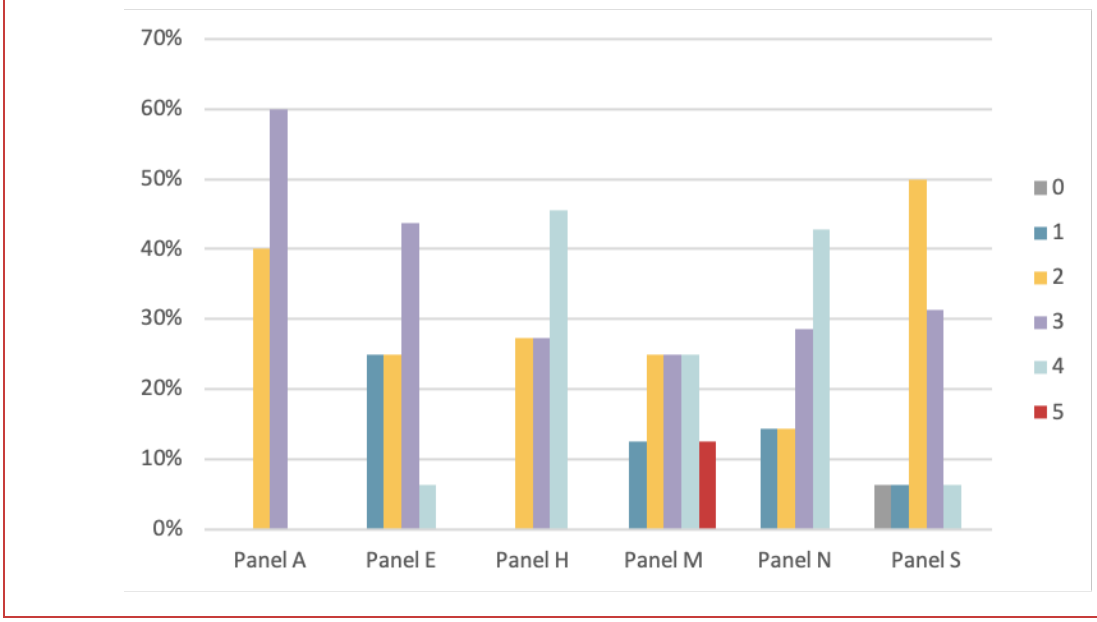


Figure 6 illustrates distribution of scores for economic impact. Score 3 dominates in most Panels, with Engineering and Technology having an equal number of scores 3 and 4. This is likely to indicate the direct and obvious economic impact that Engineering and Technology research can potentially have. Due to the mostly applied nature of the Agriculture, Forestry and Veterinary Sciences units evaluated, as well as significant efforts put into establishing and strengthening collaboration with industry, all units scored 3 and above. The State Forest Research Institute "Silava" has demonstrated particularly high importance research for industry, and scored 5.

Figure 6 Distribution of scores: Economic impact

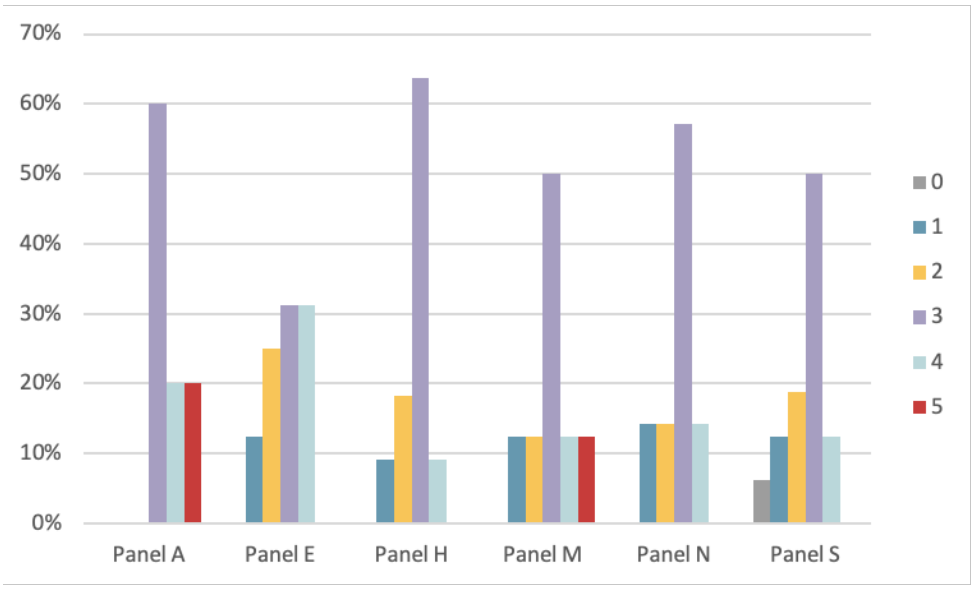


Figure 7 shows the distribution of scores for social impact. As with economic impact, the most common score for social impact was 3. However, scores 3–5 constitute 80% of all scores indicating the important role of research in supporting social impact. All research disciplines make an important contribution to social impact. Similar to economic impact, social impact was scored above 3 in all units of Agriculture, Forestry and Veterinary Sciences. Performance of the Institute of Literature, Folklore and Art of the University of Latvia in Humanities and Arts, the Institute of Wood Chemistry in Natural Sciences and the Institute of Organic Synthesis in Medical and Health Sciences was scored with 5, indicating outstanding social impact.

Figure 7 Distribution of scores Social impact

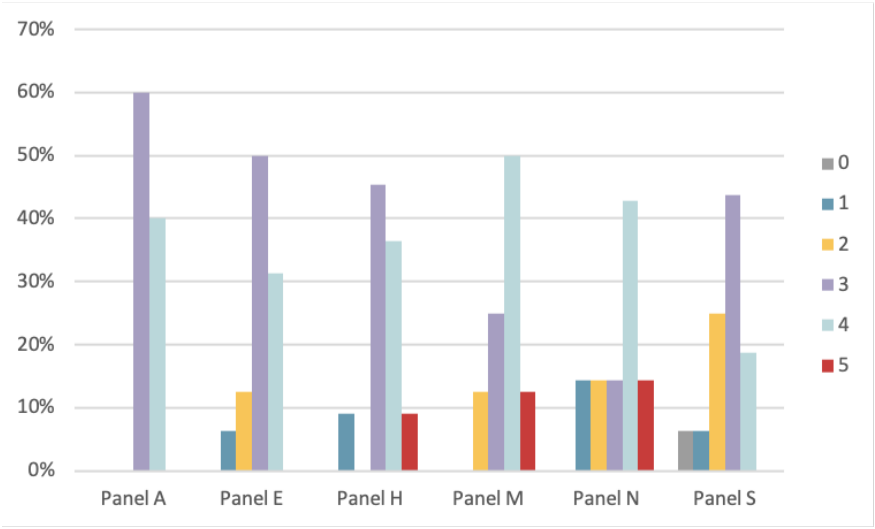


Figure 8 illustrates distribution of scores awarded for research environment and infrastructure. Again, 3 is the most common score. Agriculture, Forestry and Veterinary Sciences have no scores below 3 and Natural Sciences have a high proportion of score 4. Social Sciences have no scores above 3 and have as many units scoring 2 as 3.

Figure 8 Distribution of scores: Research environment and infrastructure

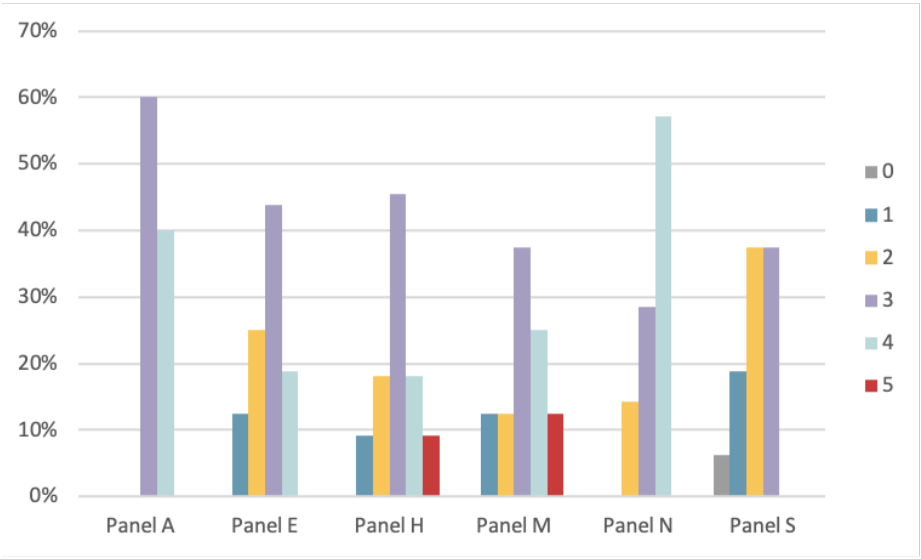
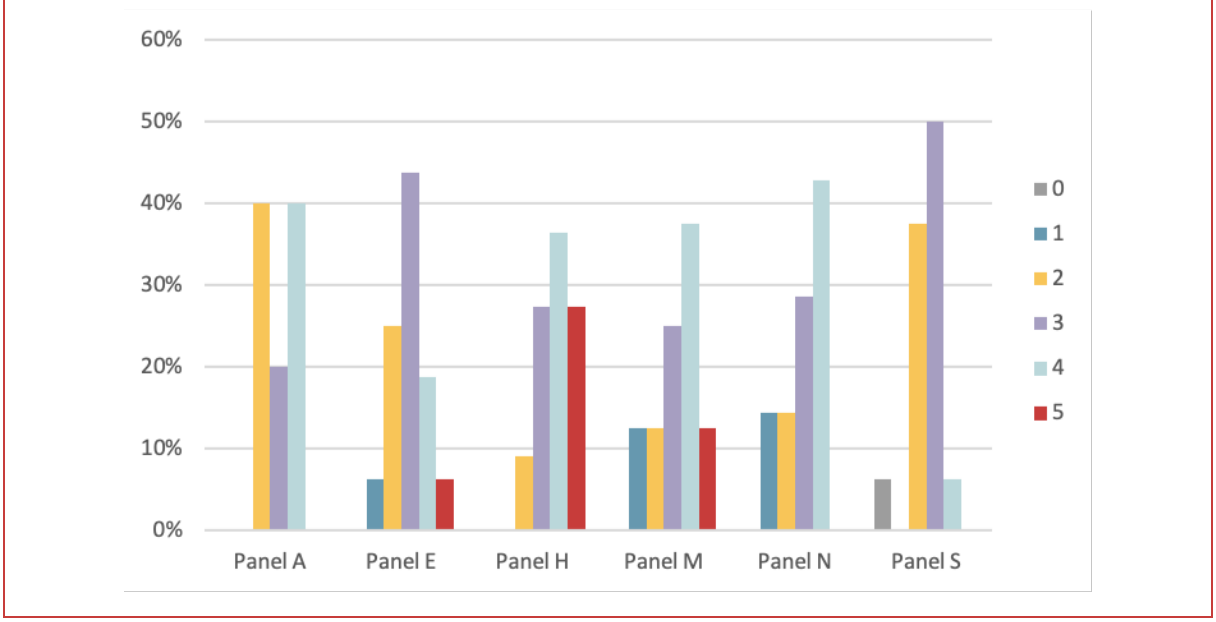


Figure 9 illustrates the scores awarded for development potential. As with all criteria, 3 is the most common score here. This is also a criterion with the highest number of scores 5 (five units in total). Units with outstanding development potential are identified in three fields – Humanities and Arts, Engineering and Technology and Medical and Health Sciences.

Figure 9 Distribution of score: Development potential



4 Summary of the Panels' observations

4.1 Observations across all Panels

Progress since the Research Assessment Exercise in 2013

The evaluation was performed following the same method and process as for the Research Assessment Exercise in 2013 (RAE 2013), with only small modifications. The key difference was the separation of the previously combined criterion for economic and social impact into two distinct criteria enabling the economic and social impact of units to be evaluated separately. In this evaluation the Panels were also required to provide a qualitative assessment of units' ability to support post-doctoral training and their contribution to the Smart Specialisation Strategy and other state policy objectives. Changes were also made to the methodology used for the bibliometric analyses. The analysis was done using both the Web of Science and Scopus.

In terms of evaluation processes, the major differences were the right given to the units evaluated to approve the Panel membership, as well as to provide factual feedback on the Individual Reports for their institution. Due to Covid-19, a major difference to RAE 2013 was the use of virtual site visits for all Panels except one and, unlike in RAE 2013, all units were visited by all Panel Members.

Acknowledging the method and process similarities to RAE 2013, all Panels commented and compared the overall performance over time (where it was appropriate to do so)[3] and without exception concluded that there has been a clear overall improvement in performance. This is also evident in scores awarded. As summarised in section 3 of this report, the most common score across all evaluation criteria, as well as for the overall score, is 3, while in RAE 2013 the most common score in all criteria and for the overall score was 2.[4]

According to the Panels, for some units the progress over the six years between the evaluations has been significant, while for others progress is occurring slowly and/or is very limited. The Panel Members praised the many units that had seriously considered the recommendations of RAE 2013 and implemented specific actions to address them. This has resulted in significant progress in many cases. The Panels observed general improvement in the number of publications published in international scientific journals, extended international collaboration networks, considerable investment in research infrastructure as well as better research management. Overall, the fragmentation of research activities has decreased as a result of institutional mergers, though there are still fields with potential for improvement and further mergers. It was also observed that the effects of mergers, requiring the alignment of different research cultures as well as operation, take time to become evident. Similarly, changes in research practice more generally – changes in mindset and practice towards more internationally relevant research questions, building and sustaining international research partnerships – take time and still require significant effort to bring the expected benefits.

The Panels were impressed with the investments in research infrastructure but also observed that they were not always supported with relevant staff skills and a strategy for efficient use and maintenance of the infrastructure.

Acknowledging the above, the Panels drew several conclusions about systemic weaknesses that can be observed across the fields.

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[3] i.e., where the institutes evaluated were the same ones evaluated in 2013

[4] Technopolis Group, 2014. Research Assessment Exercise: Summary report. Available at: https://www.izm.gov.lv/sites/izm/files/data_content/zisi_031.pdf

Insufficient base funding for research

All Panels observed that the base funding for research is insufficient. This is nothing new and has been reported in numerous previous studies.[5] As a result, many units have become very good at attracting either national or, to a lesser extent, international competitive research funding. While being able to attract competitive funding is relevant and contributes to research performance, dependence on this type of funding is insecure and makes research units dependent on the funding rules and themes supported. This restricts research topics, does not allow sufficient discipline development and can make it hard to follow a robust long-term research strategy.

European Structural and Investment Funds (ESIF) funding often come with stricter regulation and administrative burden. Panels observed that often units have to invest a lot of time in management of these projects. Some units try to cope with this by establishing dedicated support units, however, significant resources have to be devoted to administration. ESIF funded measures are very significant and well perceived by the units. However, often the design or the administration rules of the measures are problematic. For example, the post-doctoral research support programme has helped to attract and fund many young researchers; however, due to the programme requirements it has been difficult to attract foreign post-doctoral researchers, although this was one of the programme objectives.

Balance between basic and applied research

A further issue, related to that of insufficient base funding, is the issue of the balance between basic and applied research performed at the units. Several panels commented on this.

The Social Science Panel noted that insufficient base funding in Social Sciences not only contributes to the insecurity of the units, but also has a negative impact on the type of research that is performed and consequently on the development of the discipline. Since competitive funding in Latvia mostly supports applied and interdisciplinary research, the Panel expressed concern that too little basic research was being done in Social Science disciplines.

The Engineering and Technology Panel similarly observed that many units concentrate on applied research in response to national strategies and funding requirements, and often theoretical research is neglected. Both types of research are needed for the development of the units and to generate international impact. While it is partly up to researchers themselves to define relevant research topics and find ways to add their contribution to theoretical discussions, it is also clear that stable government base funding would provide better opportunities to develop a more balanced research portfolio.

Fragmentation

Although the high degree of institutional fragmentation observed in RAE 2013 has been reduced as a result of mergers and other forms of restructuring, all Panels except Humanities and Arts and Agriculture, Forestry and Veterinary Sciences observed that further reduction of fragmentation would be both desirable and possible. In all Panels there were units that lack

[5] See for example:

European Commission, 2018. Latvian Research Funding System Final Report. Horizon 2020 Policy Support Facility. Available here: https://rio.jrc.ec.europa.eu/en/policy-support-facility/specific-support-latvia

European Commission, 2019. Development of the Human Capital for Research and Innovation in Latvia. Horizon 2020 Policy Support Facility. Available here: https://rio.jrc.ec.europa.eu/index.php/policy-support-facility/specific-support-latvia-ii

European Commission, 2018. European Innovation Scoreboard 2018, Latvia. Available here: https://ec.europa.eu/docsroom/documents/30689

the critical mass to have significant impact and which would benefit from joining forces with other units in their field. Panels recognised the socioeconomic relevance of units located in regions but observed that they often struggle to attract and fund sufficient numbers of researchers.

Fragmentation seems to be most evident in Social Sciences. According to the panel, the size and shape of the sector is still far from ideal for a small country. There is still a significant number of very small research units, many, though by no means all of which, have only a very modest research profile and have a similar research focus to other units.

Publication strategy: quantity versus quality

RAE 2013 observed that units publish too few of their research results in international peer-reviewed journals. This has significantly improved across all disciplines. However, quantity does not always mean quality. Panels observed that publication strategy is often focused on publishing more instead of better. There are still units that have set up their own journals in order to create a publication channel, though in many cases following RAE 2013 recommendations journals with limited impact have been abandoned. Conference proceedings are often targeted to increase the number of Web of Science and Scopus indexed publications. Though in some disciplines (e.g., Engineering and Technology) conference proceedings are very relevant, greater impact on the discipline can be obtained by publishing journal articles or focusing on high quality conferences. Many units have a strategy focused on quality, but it is not always followed up.

Another trend often observed across Panels is the peripheral role of Latvian researchers in multi-author publications, potentially indicating that their contribution to the formulation of research problems is limited and that their role is likely to focus on contributing to data collection.

Few researchers are active on editorial boards or in journal peer reviewing. Performing peer review for journals is a way to better understand international standards.

Research environment and infrastructure

All Panels recognised and praised recent investments made in research infrastructure. However, there are units across all Panels where there are not enough trained staff (e.g., only one person knows how to operate the equipment) or staff are not qualified to use the infrastructure fully. This creates a risk that, if key personnel decide to leave, the infrastructure will not be exploited.

There are some positive trends in research environments. More units have defined research strategies and improved their research management. However, several Panels concluded that these often define too broad research areas and are not supported by sufficient human resources, or human resources are fragmented and split into very small research groups unable to produce significant impact. There are still many units that simply do not have research strategies, or have strategies that are insufficiently detailed and thought through to be effective. Often, strategies fail to analyse thematic advantages and opportunities, and hence resources are spread across a range of themes without a clear vision of what the institution's strengths are and how these could be developed further.

Doctoral training, post-doctoral positions and human resources

As mentioned above, Panels praised recent investments in research infrastructure, but incentives for human resource development are still obviously insufficient. The termination of the European Social Fund (ESF) funding for doctoral studies is visible in the decreased output of doctorates. It is suboptimal that doctoral students have to combine funding from several research projects to support their studies. In many cases doctoral students claimed that it is beneficial to be involved in multiple research projects. However, this – combined with the need for many doctoral students to have a paid job alongside their studies – leaves less time to focus

on doctoral research. As a result, completion times are often long compared with what is common elsewhere in Europe.

Funding was not the only problem with doctoral programmes. Several Panels concluded that doctoral programmes often lack structure and fail to provide an adequate level of interaction among students. Where doctoral training is provided in collaboration between a higher education institution and an independent research institute, the structure of the programme is often unclear.

The introduction of a new doctoral studies and funding model should help alleviate these problems. It is very important to support a young generation of researchers by providing stable doctoral studies funding. All the Panels enjoyed meeting doctoral students at the end of the institutional visits. In the majority of units, doctoral students and young scientists demonstrated that they had well-defined and relevant research topics, a good understanding of what constitutes scientific quality and general enthusiasm about their research work.

Post-doctoral support is now available and is well utilised by research units, but as with previous ESF measure for doctoral support, there is a risk that this funding will end without being replaced by national resources. Units will then struggle with attraction, integration and funding for young and active scientists. Postdoctoral training is not always systematically planned and funded by the individual units.

Other human resource development activities remain inadequate. It is still not a common practice for Latvian researchers to have long-term visits or sabbaticals abroad. This prevents them from developing strong long-term relationships with foreign research partners.

Internationalisation

In general, Panels observed that research units have become more active and integrated into the international research landscape. Nonetheless, it was agreed that international exposure is insufficient. Long term visits of foreign researchers are rare and outward mobility is more evident among the young generation. Panels often noted a lack of interest in going abroad to be exposed for a long period to other scientific communities. The reasons for this are often institutional – insufficient funding to support mobility and insecurity associated with moving, though in some cases it seems that there is also a lack of genuine interest.

Units have managed to establish joint research with foreign partners in the EU Framework Programme or through other funding instruments. However, in many cases Latvian participants play minor or peripheral roles in consortia and project participation does not result in publications. New participants in the Framework Programme often find they are assigned minor roles in the first instance. If they demonstrate their quality and ability to deliver, entrants can get more responsible roles as they win the trust of their partners. Some units have managed in this way to secure a place in project partnerships and can now strive for work package and project leader roles.

Research-industry cooperation

Overall, the Panels conclude that research-industry links have improved and, in a few cases, (Institute of Organic Synthesis, several RTU faculties, Institute of Electronics and Computer Science, SILAVA, Institute of Wood Chemistry) are very strong. Recently, RTU introduced an industrial PhD programme. Some large state-owned enterprises (LMT, TET) are involved in the programme. Another state-owned company - Latvian State Forests – is active supporter of research performed in Agriculture, Forestry and Veterinary Sciences discipline. There is some evidence that technology scouts operating in the Investment and Development Agency of Latvia are familiar with developments in research units and are working with the research units to seek commercialisation opportunities with businesses. Some policy measures are in place to stimulate research-industry links (e.g., Competence centres programme; technology scouts, practical research programme, etc.), but their scale could be increased in terms of funding as

well as other types of support. At present, joint research projects with industry are rather small and the industry contribution is limited. This is not surprising given the structure of Latvian economy. Panels repeatedly point in their recommendations to the need further to explore industry needs in Latvia and beyond. In several cases recommendations were made to better institutionalise collaboration with industry and ask for industry commitment when research infrastructure is set up to serve industry needs.

Performance of research institutes versus universities and higher education institutions

Another trend observed already in RAE 2013 is unequal research quality between research institutes and universities and higher education institutions. Out of 16 units with an overall score of 4 or 5 (see complete list in Appendix A) only seven are units from universities (5) or higher education institutions (2 – both in Humanities and Arts). With the exception of some RTU units and RSU Medicine platform, other universities and higher education institutions have failed to demonstrate very good and outstanding levels of research. This has to be interpreted with caution, since although the University of Latvia scored 3 in the Natural Science panel it was clear that there are research groups in the University of Latvia that would score higher if evaluated separately, indicating that there are islands of excellence in the university. Nevertheless, the general pattern is that higher quality research can be found outside universities and higher education institutions. One obvious reason for that is the teaching-research time imbalance in universities and higher education institutions. On a positive note, universities and higher education institutions have more or less well-established links with research institutes in providing PhD training and in doing joint research.

4.2 Panel-specific observations

Some Panels observed issues that are specific to the respective field. Most relevant findings are summarised below.

Humanities and Arts

Compared with the situation during RAE 2013, several high scoring units in Humanities and Arts have made significant progress in reducing their over-focus on Latvian issues. The Panel was impressed by the efforts to develop the study of Latvian culture into a topic of international interest within fields like historical, linguistic and cultural studies of border regions, musicology, art, library studies and urban development. This change in focus and ability to position research questions in a way that is interesting and relevant for the international research community is also one of the reasons for improved overall research quality and impact achieved by some Humanities and Arts units. These units demonstrate very well how this re-orientation can be beneficial for the unit. However, isolation is still prevalent in other Humanities and Arts units with lower scores.

Agriculture, Forestry and Veterinary Sciences

The Panel observed that units obtaining higher scores in the RAE 2013 made more progress in terms of research quality and impact than the units with lower scores. The performance gap between the best and the rest has therefore widened.

Significant institutional re-arrangements were made in some Agriculture, Forestry and Veterinary Sciences units after RAE 2013. While in general the Panel concluded that this has been beneficial and has brought the desired results, cultural differences between the merged units have not been fully bridged and therefore more work needs to be done by senior leaders and management to make good use of the benefits and synergies that merging enabled.

Medical and Health Science

While problems in doctoral training were identified by all Panels, they were particularly emphasised in Medical and Health Sciences, especially concerning university hospitals. The

Panel was concerned that in the university hospitals PhD students do not have enough research time due to clinical care responsibilities and doctoral supervision is inadequate. The Panel believes these problems in PhD training have a negative impact on the prospects of the relevant research units.

Social Sciences

In Social Sciences, the Panel was concerned about the great focus on publication metrics rather than on achieving real internationally recognised quality. The focus on the volume of publications is holding back the development of the field. Limited base funding and dependence on competitive funding has negative consequences for the development of disciplinary research. The Panel was also concerned about the lack of reference to any national or regional (Baltic) organisations or learned societies that support social science research. Such organisations could potentially play a role in raising the standards and quality of research.

Natural Sciences

The Natural Sciences Panel pointed to several problems in research careers. There is a gap in the middle generation of researchers, threatening future succession in the leadership positions. Although recently a structural funds-supported postdoctoral support programme has been introduced and has provided support to young scientists, at the institutional level support for this career stage is often insufficiently addressed.

The Panel pointed to the low level of collaboration with industry, which is understandable considering the structure of Latvian industry but is nonetheless problematic for both research and industry. The Panel encouraged research units to consider foreign industry collaborators.

Engineering and Technology

In RAE 2013, many of the Engineering and Technology units lacked critical mass, and this limited their potential. The Engineering and Technology Panel was pleased to note that the fragmentation in research has been reduced and appropriate amalgamations of units have taken place.

There is a slight concern that many units are concentrating on applied research, for example, in response to national strategy documents, so that theoretical research will be neglected. In many subjects, both theoretical and applied research are required and both are essential.

4.3 Observations on the evaluation process

Number, size and composition of units for assessment

All the Panels welcomed the progress made in consolidating the units and creating a less fragmented landscape. However, in some cases this resulted in units of assessment that were made up for the evaluation, represent too wide spectrum of research sub-fields with high variation in performance, and are not representative of real administrative units. This complicated the evaluation significantly. It was difficult for the Panels to describe variations in performance among the disciplines presented in these units. It was also clear that these units include some excellent research groups alongside groups with less impressive performance. This made an appropriate scoring very difficult. The structure of these units made it difficult to assess the research management practices and research environment in general, because those vary across the administrative units that were brought together for evaluation. The composition of some units made it difficult to deliver precise bibliometric indicators and extra effort was needed to clarify staff numbers for departments constituting the unit of assessment.

Quality of self-assessment reports

Self-assessment reports generally provided the information needed to perform the evaluation. However, in many cases contradictory information was presented in different sections of the self-assessment. Some larger units failed to present a coherent and well-edited story, instead presenting diverse research areas.

Somewhat related to the composition of the units discussed above, the Panels found it difficult to obtain a precise picture of the categories and functions of academic staff in relation to their research obligations and their institutional affiliation (faculties, institutes, departments, centres). The way in which research personnel in FTE were presented in the self-assessments was not always clear enough to let Panels understand the actual numbers of full-time personnel conducting research in the units. This was in all cases clarified during the institutional visit, but it should have been presented clearly from the beginning in the self-assessments.

Types of submissions and language of outputs in Humanities and Arts

The Humanities and Arts Panel concluded that in some cases a better understanding of the full picture of research performance could be obtained if more diverse types of outputs – especially non-textual outputs – were considered, in order fully to capture the research results. Another concern was assessment of the outputs submitted in Latvian. Latvian speakers were not appointed to the Panel, because potential candidates did not meet the criteria defined in the Regulation on Procedures for Organising the International Evaluation of Scientific Institutions Activity. The Panel had to make extra efforts to ensure fair evaluation of the units.

Bibliometric analysis

Bibliometric indicators in RAE 2020 were produced based on institution names instead of lists of researcher names, as had been done in RAE 2013. Since many units represented a combination of departments and faculties, and the unit being assessed was not a real-life administrative unit that could be identified in the bibliometric databases, subject areas were used to identify units in bibliometric databases. Thus, for these units' bibliometric analysis produced results that adequately indicate general publication trends but are not very exact. If very precise bibliometric indicators are expected, researcher names should be used to develop bibliometric indicators.

Institutional visits

All Panels except Medical and Health Sciences visited units remotely. Despite significant change in the visit format, all Panels confirmed that the process was smooth, and the Panels were able to gather the information needed to perform the evaluation. The short videos presenting research infrastructure were well received and helped Panels to understand what kind of research infrastructure is available in the units. Nonetheless there was also unanimous agreement that physical visits would be preferred and, in the future, if possible, institutional visits should not be virtual.

The requirement to perform visits to all evaluated units is reasonable and justified. Institutional visits enable the Panel to clarify information presented in the self-assessment, learn in more detail about the research and explore research environment and infrastructure. However, the requirement for the entire Panel to visit each unit is challenging from a logistical point of view as well as questionable in terms of added value. Unless the number of units is significantly decreased, it is logistically very challenging if not impossible to organise physical institutional visits by all Panel Members to all units. A Panel can typically visit Latvia for one week. High level experts required for the evaluation are not able to be away from their duties for more than that. But one week is not sufficient for all Panel Members to visit all units, especially given the geographical distance between units located in the regions. In future, two options are

available to enable Panel visits to all units First, more experts can be recruited and can be split into sub-panels visiting units in different weeks. This was the procedure in this evaluation. The Panel still requires one Panel chair, and it can be very difficult to find a chair who is available to visit Latvia for more than one week. Recruiting more experts increases the costs of evaluation. Second, to avoid recruiting more experts the Panel can be split for institutional visits so that each unit is visited by Panel Members who represent relevant disciplines and have familiarised themselves with the self-assessment and research outputs in detail. In this way, Panel Members can visit units simultaneously. In the end, a Panel still makes a collective decision and impressions from the visit are shared by the Panel Members who have learnt most about the unit. This was what was done in RAE 2013 and it proved adequate for collecting the necessary information and making Panel decisions.

Feedback procedures

Unlike in RAE 2013, units were informed about and could provide feedback on the Panel composition. Panel composition is very crucial in informed peer-review evaluation to ensure well-balanced disciplinary coverage. Thus, ensuring acceptance of the Panel membership by those being evaluated contributes to the quality and the acceptance of the evaluation, and is welcomed.

In addition to the above, units were provided with an opportunity to fact check Panel Reports. In the case of disagreement with the Panel evaluation, units' comments could be published in the appendix of the Panel Report to ensure that disagreement is not hidden. While fact checking is a welcome introduction to ensure that Panel evaluation is based on correct information, it was sometimes confused with feedback on Panel assessments. Panel evaluation is collective effort made by carefully selected, well recognised experts in relevant field and conducted according to an agreed methodology. There is inherently no place for negotiation about Panel judgements, which is why international peer review assessment practice specifically excludes appeals against panel judgements and will consider only appeals based on factual error or abuse of process. In future exercises, it may be useful to emphasise to participants that Panels' judgements are not negotiable.

5 Recommendations

Panel-specific recommendations are provided in the Panel Reports for each discipline. Below are general policy recommendations based on Panel observations as well as recommendations to improve the assessment process.

5.1. Policy recommendations

The main concern about the research assessed here is still the inadequate level of base funding by government, as well as the insufficiency of funding for specific activities to strengthen research performance, in particular, funding for internationalisation and inward and outward mobility. Given the economic and fiscal context this is understandable and unfortunately the Covid-19 pandemic is likely to have further negative effects on the overall government budget. At the same time, the pandemic and its consequences vividly illustrate the need for quality research and its contribution to many challenges posed to the society. **To build a competitive economy and to be able to respond to its other challenges, the government needs to invest in research and innovation.** Failure to do that will result in mediocre if not poor research performance and insufficient production of highly qualified human resources.

ESIF funding has undoubtedly been very important in funding and developing Latvian science and will continue to be very significant source, at least in the next few years. However, as is evident from the observations made by the Panels, long-term dependence on competitive funding is not healthy. **A greater proportion of national base funding is needed to ensure stability, continuity and to prepare the ground for development.**

More investment is needed for human resource development, either from national base funding or from other sources. The planned increase in doctoral funding is a positive development, but further **investment is needed to provide stable and long-term post-doctoral funding and long-term inward and outward staff mobility.**

Funding measures should not only use the quantity of Web of Science or Scopus publications as a performance indicator. Publication practices vary among disciplines and fields, so when bibliometric indicators are used to assess quality, these need to be both calculated and understood in field-specific ways. The quantity of output can potentially still be one indicator in assessing publication activity, but it should be accompanied by a measure that incentivises quality. Indicators not based on publication should also be used.

To address insufficient research-industry collaboration and to diversify potential research careers as well as increase company RDI capabilities, **industrial PhD schemes can be considered**. RTU has recently found a way to use some European Regional Development Fund funding to test the approach on a small scale. This indicates that there is interest on both sides (research institutions and industry) and a dedicated government programme to co-fund PhD studies in companies could be introduced.

RAE 2013 seems to have had a significant impact on the units. The fact that most units have tried to implement RAE 2013 recommendations indicates that, in general, research units in Latvia value the evaluation process and make efforts to address the criticisms and recommendations. Responding to RAE 2013 recommendations, some units have managed to increase their performance despite the loss of base funding due to a low score in RAE 2013. Although continuing poor or merely adequate performance may be reason for policymakers to revise their view of units' future prospects, **scores would best be read in combination with the analyses and recommendations when making judgements about funding, allowing units with potential to be supported in making improvements based on the current evaluation.**

In Social Sciences there is still great fragmentation as well as comparatively lower performance. **Consolidation measures should be considered in this discipline.**

The overall slightly positive trend in research performance needs to be perceived with caution. Research is a competitive activity and units have to invest significant effort to sustain research quality and impact. Maintaining a good level of research requires that effort is invested in continuous development. Units must have strong and well thought through research strategies and support for their implementation in order to sustain a good level of research.

5.2. Recommendations for future evaluation process

The organiser of the evaluation should **perform some basic quality check for submitted self-assessments** to guarantee that robust evidence is delivered to the Panels.

The RAE 2013 was followed by useful reforms that encouraged consolidation within and among Latvian research-performing organisations. In some cases, this has resulted in organisational entities so broad and diverse that they cannot coherently be treated as single units of assessment. **Future assessment exercises should break these down into a small number of more homogenous units of assessment.** If large units consisting of diverse research fields and administrative structures are nonetheless presented for assessment, **more detailed documentation for each field should be requested in the self-assessment and individual scores should be assigned for the research quality of each sub-discipline.**

Future assessment should also have a minimum threshold for the size of units of assessment to avoid participation by very small units with limited institutional capacity.

To better capture economic and social impacts of research, an approach introduced in UK Research Excellence Framework (REF) requiring submission of impact case studies can be considered. REF requires each unit of assessment to submit a selection of impact case studies for the assessment. An impact case study is a four-page document, describing the impact of research undertaken within the submitting institution.

In Humanities and Arts, more diverse types of outputs should be allowed for submission including non-written outputs. Alternative output formats are likely to increase in future best practice of research evaluation and diversification of considered research outputs is encouraged also by the world-wide initiative The Declaration on Research Assessment (DORA). **Some flexibility should be allowed when recruiting peers for the Humanities and Arts Panel to include Latvian speakers**. Basic peer selection principles such as lack of conflict of interest and well recognised research output should be strictly followed, but very strict criteria in terms of bibliometric performance can be eased in order to find good candidates. This is especially relevant for the Panel to be able to fully assess the quality of outputs submitted in Latvian. It is increasingly recognised that research assessment in humanities should aim at recognition of outputs published in diverse languages.[6]

Unless the number of evaluated units decreases, it is recommended to **organise institutional visits with participation of a minimum of three Panel members** who represent the scientific discipline of the unit visited.

[6] Ochsner M et al. (2017). The future of research assessment in the humanities: bottom-up assessment procedures. Palgrave Communications. 3:17020 doi: 10.1057/palcomms.2017.20. Full text available at https://www.nature.com/articles/palcomms201720

Appendix A Assessment criteria

The Panels scored the research performance of each unit using the scale presented in Table 2 (using whole numbers only).

Table 2 Overall assessment criterion: Quality of the Research Performance of the Institution

QUALITY OF THE RESEARCH PERFORMANCE OF THE INSTITUTION	
SCORE	**DEFINTION**
5	Outstanding level of research
4	Very good level of research
3	Good level of research
2	Adequate level of research
1	Poor level of research

The score assigned to the overall assessment was be based on the assessment of five sub-elements A to E listed below and illustrated in Figure 10. The Expert Panel provided the final overall score based on its overall view and not generated by mathematical average. The criteria and scoring for each sub-element are described in tables below.

A The quality of the research

B The impact on the development of the field of science

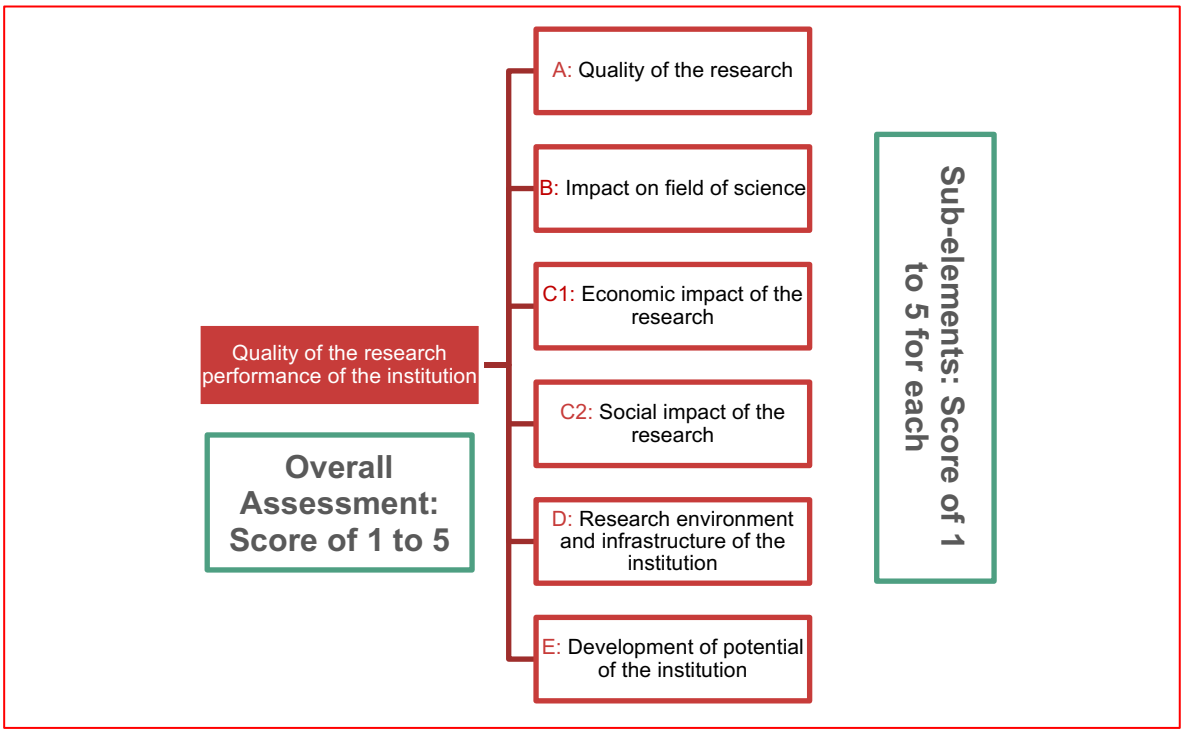
C The economic impact (C1) and social impact (C2) of the research

D The research environment and infrastructure of the institution

E The development potential of the institution

The Panel provided scores against each sub-element and the overall score and provided narrative descriptions of its scores, the overall score and the sub-elements. The overarching final assessment of each institute includes the Panel's qualitative assessment of the institutes' alignment with the objectives of the State scientific and technological development. The Panels provided an assessment of each institute's potential to offer doctoral training.

Figure 10 Assessment criteria



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Sub-elements

Tables below describe the criteria and the 5-point scoring system for each sub-element.

Table 3 Criterion A: Scientific Quality

A: QUALITY OF THE RESEARCH		
Particular factors to take into account		• Fundamental and applied research shall be evaluated as being of equal significance
SCORE	**DEFINTION**	**DESCRIPTION**
5	**Outstanding**	**The institution is a Global Leader.** In terms of the quality, the research output of an institution is comparable with the best work internationally[7] in the same area of research. The research possesses the requisite quality to meet highest standard in terms of originality, significance and accuracy. Work at this level should be the primary point of reference in the respective area.
4	**Very good**	**The institution is a strong international player.** Research by the institution possesses a very good standard of quality in terms of originality and importance. Work at this level can arouse serious interest in the international academic community, and international publishers or journals with the most rigorous standards of publication (irrespective of the place or language of publication) could publish work of this level.
3	**Good**	**The institution is a strong national player with some international recognition.** The importance of research by the institution is unquestionable in the experts' assessment. Internationally recognised publishers or journals could publish work of this level.
2	**Adequate**	**The institution is a satisfactory national player.** The international academic community deems the significance of the research by the institution to be acceptable. Nationally recognised publishers or journals could publish work of this level.
1	**Poor**	**The institution is a poor national player.** Research by the institution contains new scientific discoveries only sporadically. The profile of the research by the institution is expressly national, i.e., the institution is not involved in international debates of the scientific community. It focuses mainly on introducing international research trends in Latvia.

[7] The designation "international" indicates that the activity and achievements of units are internationally comparable with globally recognised research teams in the same area of research.

Table 4 Criterion B: Impact on the Scientific Discipline

B: IMPACT ON FIELD OF SCIENCE		
Particular factors to take into account		• The impact of the research on the development of the scientific discipline and related fields
SCORE	**DEFINTION**	**DESCRIPTION**
5	**Outstanding**	**The institution is a Global Leader.** The research outputs of the institution are published in the leading forums of the respective discipline, and they have a considerable impact on the development of the discipline; the institution is highly valued as a partner in international research projects.
4	**Very good**	**The institution is a strong international player.** The institution is internationally recognised in its discipline and is highly regarded as a partner in international research projects and networks.
3	**Good**	**The institution is a strong national player with some international recognition.** The institution occupies a stable position in the international scientific community, is considered a respected and recognised centre of competence, and possibly hosts national research centres.
2	**Adequate**	**The institution is a satisfactory national player.** The institution occupies a stable position in the national scientific community. The position of the institution within the international scientific community is still evolving; it still has to strive for its status as a recognised member of the discipline; its impact on the international scientific community is undetermined.
1	**Poor**	**The institution is a poor national player.** The publishing strategy and scientific impact of the institution are predominantly geared towards the national scientific community and have limited impact also at national level.

Table 5 Criterion C: Economic and Social Impact

C: ECONOMIC (c1) AND SOCIAL IMPACT (c2)		
Particular factors to take into account		• Economic impact scoring will consider relevance to, and cooperation with, economic actors (with a particular focus on the national economy) • Social impact will consider development of the social and cultural spheres, the promotion of higher education, social equality, integration and welfare, public health, national security, public understanding of the significance of scientific activity
SCORE	**DEFINTION**	**DESCRIPTION**
5	**Outstanding**	**Highly Important Research and Highly Sought-after R&D Partner by Non-academics.** Research of the institution is highly important for the economy/society, which renders the institution a highly esteemed partner in research and development projects outside the academic environment. Staff members of the institution are in high demand as experts in the private/public sector/the public, and the institution is an important driver of societal development.
4	**Very good**	**Very Important Research and Sought-after R&D Partner by Non-academics**. Research of the institution is very important for the economy/society. The institution's interactions with the private/public sector/the public stand out in terms of their extensive and dynamic nature.
3	**Good**	**Important Research and Satisfactory Level of Interaction with Non-academics.** Research of the institution is important for the economy/society. The institution's interactions with the private/public sector/the public are at a level that is expected of recognised academic institutions.
2	**Adequate**	**Important Research but Low Level of Interaction with Non-academics**. Research of the institution is important for the economy/society. The research activities of the institution are characterised by a low level of interaction with the private/public sectors/the public.
1	**Poor**	**Important Research but no Interaction with Non-academics**. Research of the institution is important for the economy/society. The interaction by the institution with the private /public sectors/the public is yet to be established.

Table 6 Criterion D: Research Environment and Infrastructure of the Institution

D: RESEARCH ENVIRONMENT AND INFRASTRUCTURE OF THE INSTITUTION		
Particular factors to take into account		• Organisation of the management of research at the institution • The long-term strategic and financial resource planning, including the human resource development strategy • The goal orientation of the research work • The availability and quality of support services, research infrastructure, databases, technical staff, staff teaching and training workload, the ratio of students involved in research to the overall number of staff members, etc. • Ability to ensure open access to research results
SCORE	**DEFINTION**	**DESCRIPTION**
5	**Outstanding**	**The institution is a global leader**. The institution's research environment is fully comparable to the best international institutions in the discipline, in terms of the organisation, strategy and infrastructure of research work. It can attract the highest quality international researchers.
4	**Very good**	**The institution is a strong international player.** The institution is able to provide an internationally comparable excellent research environment to high-level international scientists in the given discipline.
3	**Good**	**The institution is a strong national player**. The institution is able to provide a research environment that is comparable with globally recognised academic institutions in its discipline.
2	**Adequate**	**The institution is a satisfactory national player**. The institution's research environment is still evolving to achieve a level that is expected in the international scientific community of a respected institution in the given discipline.
1	**Poor**	**The institution is a poor national player.** The institution is still only in the process of creating an internationally comparable research environment.

Table 7 Criterion E: Development Potential of the Institution

E: DEVELOPMENT POTENTIAL OF THE INSTITUTION		
Particular factors to take into account		The development potential of an institution comprises: • The ability of researchers to participate in international competition • The capability of the scientific environment to support the chosen research • The capability of the selected scientific objectives and research themes to impact the international scientific community and society at large • The ability to initiate new research directions The assessment will take into account: • The institution's future vision and plans • How realistically the institution assesses its strengths and weaknesses, opportunities and threats, and whether the institution has a carefully considered plan to manage such factors • The future vision of the scientific institution, including to what extent the evaluation of the strengths, weaknesses, opportunities and threats of the scientific institutions is justified • The age and career progression of the active scientific staff • The ability to attract students, doctoral candidates, and foreign researchers • Ability to raise funding that is awarded competitively • Its orientation towards topical issues in the selection of research themes • Involvement in promising international collaboration projects and networks, etc.
SCORE	**DEFINTION**	**DESCRIPTION**
5	**Outstanding**	**High potential to become a global leader.** The institution is able to assume scientific leadership in the given scientific discipline. It is expected that over the next 5–10 years it will achieve a significant international breakthrough in the particular scientific discipline, and it will attract leading researchers and promising doctoral students. Within the foreseeable future, the institution is able to achieve a level of excellence that is comparable with the most outstanding institutions in the world within their discipline.
4	**Very good**	**Potential to become a strong international player.** The institution is able to establish itself as a recognised and respected player in the international scientific community within the given scientific discipline. It is expected that over the next 5–10 years it will achieve an excellent level of scientific quality and influence and will become a highly regarded partner in international collaboration projects and networks.
3	**Good**	**Potential to become an international player.** Over the next 5–10 years the institution will be able to strengthen its position in the international scientific community as a convincing actor and a trustworthy partner within international collaboration networks.
2	**Adequate**	**Potential to become a strong national player**. The institution is capable of being a visible local player in its area of research, which from time to time can be expected to contribute to the activities of the international scientific community.
1	**Poor**	**Very limited scope for developing its research quality and reputation**. The institution has to work hard to establish itself as an internationally notable institution in its discipline within the foreseeable future.

Appendix B Units with overall score 4 and 5

Panel	Institution	Quality of research	Scientific Impact	Economic Impact	Social Impact	Research environment and infrastructure	Development Potential	Overall Score
A	Latvian State Forest Research Institute "Silava"	4	3	5	4	4	4	**4**
A	Institute of Food Safety, Animal Health and Environment "BIOR"	4	3	3	4	4	4	**4**
E	Riga Technical University, Faculty of Materials Science and Applied Chemistry	3	4	4	3	4	4	**4**
E	Riga Technical University Faculty of Power and Electrical Engineering	3	3	4	4	4	4	**4**
E	Institute of Electronics and Computer Science	4	3	4	4	4	5	**4**
E	Riga Technical University, Faculty of Computer Science and Information Technology	3	3	4	3	3	4	**4**
H	National Library of Latvia	4	4	3	4	4	5	**4**
H	Latvian Academy of Culture	4	4	4	4	5	4	**4**
H	Daugavpils University, Research programme "Regional studies, literature and arts"	4	4	2	4	4	5	**4**
H	Art Academy of Latvia	4	4	3	3	3	4	**4**

H	Institute of Literature, Folklore and Art of the University of Latvia	4	4	3	5	5	5	**5**
M	Latvian Biomedical Research and Study Centre	4	4	4	4	4	4	**4**
M	Latvian Institute of Organic Synthesis	5	5	5	5	5	5	**5**
M	Riga Stradins University Platform of Medicine	4	4	3	4	4	4	**4**
N	Institute of Solid State Physics	4	4	3	4	4	4	**4**
N	Latvian State Institute of Wood Chemistry	4	4	4	5	4	4	**4**