

Latvia: Research Assessment Exercise

Panel Report: Life Sciences and Medicine

technopolis _{group}, November 2013

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Introduction

The Life Sciences and Medicine evaluation Panel has followed the Latvian Research and Development policy governed by the Ministry and Education of Science's recommendation which is a follow up of a Policy Mix peer review¹ undertaken under the responsibility of the ERAB committee of the European Union². The evaluation was made under Technopolis' umbrella. The panel consisted of six experts from Austria, Belgium, Iceland, Poland, Republic of Macedonia, and the United Kingdom covering several competences focused on the following research domains: biology, biochemistry, chemistry, aquatic sciences, medicine and sport sciences.

The Life Sciences and Medicine Panel evaluated SIXTEEN institutions. The Panel used a mixture of means (remotely, by consensus meeting and through site visits) to escape bias as much as possible. Visits were of primary importance because they allowed the experts to have a direct dialogue with the researchers. Special care was taken to interview young researchers.

Amongst the 16 institutions:

- Two are truly multidisciplinary covering biomedicine, bioinformatics, genomics, pharmacology and chemistry: the **Latvian Biomedical Research and Study Centre** and the **Latvian Institute of Organic Synthesis**
- Five are mainly biology related:
 - Latvian Institute of Aquatic Ecology
 - University of Latvia, Faculty of Biology
 - University of Latvia, Institute of Biology
 - University of Latvia, Institute of Microbiology and Biotechnology
 - Daugavpils university, Institute of Systematic Biology + Department of Anatomy and Physiology
- Nine are mainly related to medicine
 - Latvian Academy of Sport Education
 - University of Latvia, Faculty of Medicine
 - University of Latvia, Institute of Experimental and Clinical Medicine
 - University of Latvia, Institute of Cardiology
 - Riga Stradins University, Division of Medicine
 - Centre of Psychoneurophysiological and Bioregulation Research
 - Paul Stradins Clinical University Hospital
 - Riga East University Hospital and Infectology Centre of Latvia
 - Contra Cancrum Coli.

¹ The Policy Mix peer review objective is to support and enhance the Science and Technology (S&T) policy dialogue between EU Member States (MS)¹, Associated Countries (AC)² to the FP7, and the countries of Eastern Europe

² ERAB is today called ERIAB (European Research and Innovation Area Board). See: http://ec.europa.eu/research/era/partnership/expert/eriab_en.htm

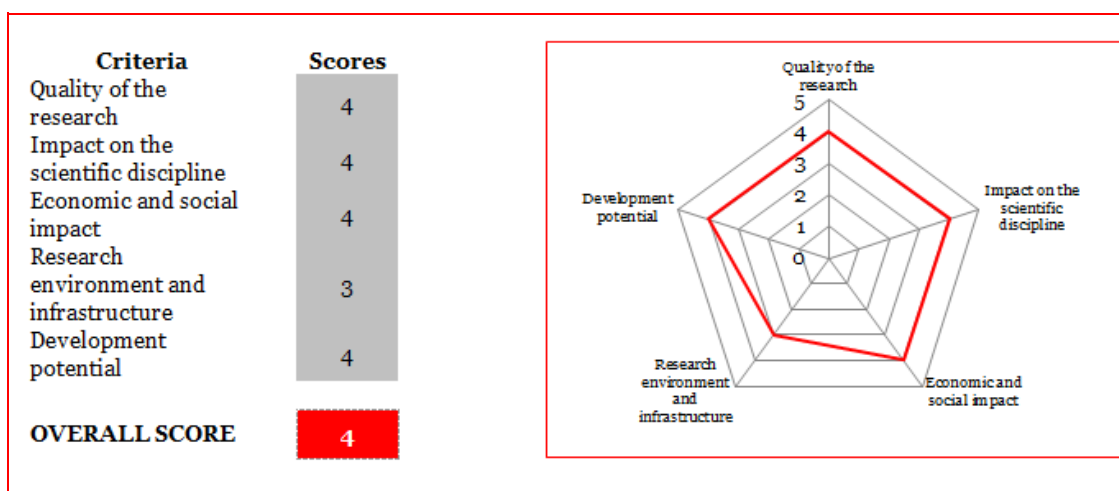
The topics covered within most of the institutions are very broad and strongly illustrate the need to restructure and refocus research topics. The analysis of each institution give details about the topics covered and is followed by recommendations with emphasis on potential efforts that could create the necessary critical research mass and environment to achieve innovative and competitive research.

1. L_01_ Latvian Biomedical Research and Study Centre

Name of the institution	Latvian Biomedical Research and Study Centre
Name of university	Latvian Biomedical Research and Study Centre
Type of institution	State Scientific Institute

The Latvian Biomedical Research and Study Centre (BMC) is one of leading research institutions in Latvia. Research conducted in this institution is focused on the field of molecular biology and biomedicine. Basic as well as applied research with emphasis on molecular genetics, vaccine development, genomics, cancer biology, immunology, biotechnology, structure biology is conducted at this institution. BMC has good size in terms of research facilities and number and qualified research personnel (senior researchers / researchers / students numbers and ratio is appropriate). In collaboration with Latvian universities BMC also participates in the educational work. BMC is a partner in several small and medium enterprises that are run in close collaboration with industry business. It is main player in collecting Genome Database of Latvian Population.

Figure 1 L_01 – Scores



Overall Score

The Latvian Biomedical Research and Study Centre is internationally well renowned and has to be ranked within the category of the international recognised research institutions. Both quality of research performed at BMC, its impact on the discipline are very good. In that terms BMC is consider as a Strong National Player with international recognition. This recognition is exemplified by high citation of research outcomes and participation in international collaborative research. The field of research spans over a wide range of topics, both fundamental and on medical applications. BMC is involved in Genome Database of Latvian Population, an important activities in Latvia that directly influences Latvian population. BMC has influenced the development of new fields in Latvia economy including development of genetic diagnostics, establishment and operation of several small and medium enterprises. By providing infrastructure for PhD research projects, BMC contributes to the higher education in Latvia. Those activities demonstrate high economic and social impact of the Institute in Latvia however this impact cannot be consider as global influence on European level. BMC has high potential to sustain and keep its leadership

on national level and international visibility if an effort on the restructuration of the laboratories and better management of the core facilities are rapidly undertaken. The research environment in terms of infrastructure organisation, management, preparation for Horizon 2020 and environment for conducting PhD programs needs to be improved.

Quality of Research

Latvian Biomedical Research and Study Centre (BMC) is a scientific centre performing basic as well as applied research in molecular biology and biomedicine. The research of the institution is focused on relatively small, well-defined number of topics. The achievements on virology, protein science and cancer research and human genetics are very good. The outcome is of good quality. This is evidenced by 182 Scopus publications in well-recognised scientific journals and by an appreciable citation record. It must be pointed out that the work performed at the institution is not published in the very best scientific journals, which makes impossible to identify BMC as a Global Leader. BMC can be considered as a Strong International Player. It is important that the institution researchers are corresponding authors and first authors of the publications, which emphasize the intellectual input into published work. The collaboration, both scientific and non-academic with industrial enterprises, both on national and international level, is a strong aspect of the institute activity.

Impact on the scientific discipline

Research quality performed at BMC can be evaluated through its influence and impact on the discipline. The relatively good citation corrected for self-citations reflects indeed the recognition by international community. BMC is the main academic biomedical research institution in Latvia and it is adequate to consider that the institution is internationally recognised in its discipline. Several international collaborations conducted with research groups from many countries reflect international connections and reflects that the institute is regarded as an international research partner. Beside basic research these cooperations led also to a number of patents submitted together with companies. It must be pointed out that, however, neither substantial preparation nor brainstorming for considering BMC participation within Horizon 2020 has been undertaken so far. International contacts are deepened by personal visits of members of BMC to institutions abroad, and by visits from abroad to BMC and on the occasion of international conferences and workshops. The mobility of researchers and PhD students should be increased. Long-term visits are appreciated.

Economic and social impact

BMC is involved in establishment of Genome Database of Latvian Population. It is an important institution in the genetic research activities in Latvia, which directly influences Latvian population. BMC has influenced the development of new fields in Latvian economy in particular in the development of genetic diagnostics. BMC has participated in the establishment and operating of several small and medium enterprises. Collaboration and joint RD projects with international partners indicate the involvement in economic development. BMC close collaboration with hospitals and spreading of knowledge within Latvian population has also been noticed as an important social impact. BMC representatives are involved in the strategic planning and legislation at the national level. BMC is involved in collaboration with Latvian universities in the educational work. Research of the institution is important for the society. To disseminate and effectuate the acquired knowledge the institution has participated in the establishment of several small and medium sized enterprises, which are running in cooperation with BMC. The institution applies for around 5 national and international patents per year. However BMC does not operate on international level in terms of commercialisation of research outputs.

Research environment and infrastructure

Regarding infrastructure for research it is mandatory that a good age balance of personnel at all levels (average age 38, over 50% of the researchers younger than 35) is performed and maintained. There is an insufficient mobility of researchers; especially long-term visits are neglected. Within BMC large and modern GLP standard facilities are currently established for animal and cell-based research. However, renewal of the spatial distribution of the laboratories with preliminary discussions at which architect, building manager and the researchers are involved is absolutely required. This is justified by the age of the building in which labs are neither located nor designed in an efficient way. Core facilities are also inefficiently organized. There is here again an urgent need to re-think what these core facilities at BMC are and how these should be managed. More centralised management is required. Work towards preparation for Horizon 2020 has been so far neglected. BMC's main emphasis in the last few years was on applications for Structural Funds money distributed by the Latvian state which was in fact easier than getting FP7 funding. Hence and although there are 3 FP7 projects endings, BMC has not put as much effort as they could have to reach the competitive level required to be internationally recognized. This could lead to BMC losing momentum in the application process, losing in becoming part of excellent European consortia. Students are involved in conducted research; however, the environment for conducting PhD studies is not adequate. More lectures and soft skills training should be provided for PhD students.

Development potential

Latvian Biomedical Research and Study Centre (BMC) is still in a position to maintain itself as a recognised and respected player in the international scientific community within the basic as well as applied research in molecular biology and biomedicine, however this reputation could rapidly declined if fast and efficient restructuring of the core facilities and laboratories design are not undertaken. It has been noticed that biomedicine and genetic programs applied in Latvian population extraordinary opportunities and should be sustained. The research strategy based on the development of molecular diagnostics, personalised therapy and innovative medicines is the right and very promising direction. It will be a challenge to sustain strong international position and efforts should be undertaken to hold it during the next 5-10 years. The main problem would be to attract young generation to participate in the research. Small number of students would be a factor limiting the research development. Improving of PhD program is required. Changes in structural management of the institution especially management of core facilities and qualified staff (unit) for grant application preparations.

Conclusions and recommendations

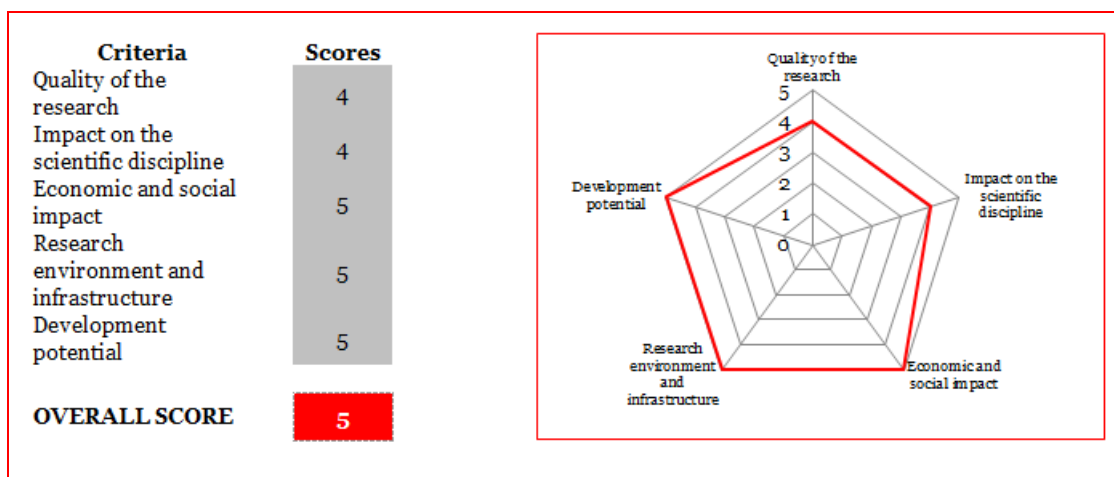
- New design and spatial distribution of labs to be undertaken.
- Core facilities are not well organized and should be redesigned and managed adequately.
- More preparation for Horizon 2020 is urgently needed. Without such efforts, BMC could loose momentum in the application process and lost its international competitive position.
- BMC works in bio banking. It seems that several Latvian institutions are involved in bio banking but it is not clear if they coordinate their efforts in the most efficient way for research.
- Mobility of researchers should be increased, both at the level of research staff and PhD students.
- PhD students need training in soft skills, e.g. how to write good scientific publications.

2. L_02_Latvian Institute of Organic Synthesis

Name of the institution	Latvian Institute of Organic Synthesis
Name of university	Latvian Institute of Organic Synthesis
Type of institution	SSI

The Latvian Institute of Organic Synthesis (IOS) is a large research unit devoted mainly to drug discovery. IOS develops very important activities in the fields of chemistry, pharmacy, pharmacology and biology. The work of the Institute resulted in a high number of patents, which are held together with industrial partners. Several drugs developed at IOS are on the market. However, beside the synthetic work driven by the need to fulfil the capital risks investors, basic research is nevertheless performed. A very large number of doctoral students are being trained and educated at IOS.

Figure 2 L_02 – Scores



Overall Score

The Institute performs research on a very high level. The results have considerable economic impact. Regarding the science performed IOS is a strong player with appreciable international recognition. However, internationality should be increased. The Institute hosts a large number of doctoral students.

Quality of Research

The very positive assessment made on the basis of the information provided in advance was fully confirmed during the site visit. The quality of research is very good. Main focus is on synthesizing compounds with potential pharmacological activity. In that field, the Institute is very successful resulting in a high number of patent applications every year. Beside this task in finding novel structures the Institute is engaged also in more basic investigations such as investigating which mechanisms preclude the reactions applied for synthesis. Taken as a whole the Institute belongs to the top-level Institutes in this field in Europe with appreciable international recognition. The internationality the Institute is currently increasing through the acquisition of Marie Curie EU grants and Regpot FP7 EU grants. Taken into consideration the size of the scientific personnel the output of publications is average. This relatively low score of average is the consequence of combined needs to protect

intellectual property and to satisfy the capital risk investors who are contractually requesting to obtain pure molecules before reaction mechanisms investigations.

Impact on the scientific discipline

Seven of the 14 research units are focused on medicinal chemistry and five are focused on organic synthesis. Some of the units perform on developing methods for a synthetic approach to novel pharmaceutically active compounds and others in finding new preparation methods for known pharmaceuticals. The high scientific output (336 according to SCOPUS analysis 2006-2011, 68 in 2012) indicates a high impact on the scientific/research discipline. However, compared to the number of researchers in the Institute this figure could be higher (see above). The Institute is also editing the internationally well renowned journal "Chemistry of Heterocyclic Compounds", original edition in Russian but page to page translated into English and published by Springer. This greatly contributes to the international visibility of the Institute. Moreover, there is joint research with Institutions outside Latvia but extension could be improved.

Economic and social impact

The economic and social impact of IOS is outstanding. This is proved by a number of facts. First, the high experience in drug design resulted in more than 70 international patents within the last five years filed together with business partners in Sweden, UK, Germany, Japan and Latvia. On the basis of these results 17 original drugs were discovered, in particular three of these have a strong position on the worldwide market. Furthermore, IOS takes over the responsibility for a large number of doctoral students. Regarding finances the basic contribution of the Latvian government is scarce. By core funding and state research grants only less than 20% of the Institute's budget is covered. Therefore, expenses of IOS have to be paid from external contracts (capital risks investors) and ESF/ERDF. For this reason IOS is forced to gain a constant financial flow from these sources. As a consequence the research programme has to take care to secure this main financial basis. This obligation, however, reduces the possibilities for basic scientific investigations important for gaining the highest international reputation possible. IOS is without a doubt a flagship Institute for research in Latvia. Therefore, an increase in governmental funding for the future is highly recommended.

Research environment and infrastructure

The research environment of IOS is excellent. The equipment and the machinery for performing research and characterisation of the compounds synthesized are up-to-date and highly performing. However, laboratory space available is limited which impedes further development for the future. A renovation of the building is planned which will comprise a new pharmacology facility, laboratories for GLP studies and construction of a laboratory for up scaling organic syntheses. The research management is highly professional and includes strict guidance and constant supervision of the doctoral students (28 at present). Scientists from the Institute are members in several advisory boards mostly in Latvia but also within the EU. The Institute has an understanding to be a bridge for scientists from the former Soviet Union to Western Europe. The Latvian Study and Research Centre of Biomedicine, the University of Latvia and Riga Technical University are both running a project "Research Infrastructure Development of the State Research Centre of Pharmacy and Biomedicine" since 2012. The aim is to improve the research Infrastructure and to concentrate the material and human resources to ensure economic development. Improvement of the age structure of the researchers through an increase in the number of young researchers is achieved.

Development potential

IOS aims to increase its international visibility. This is already achieved by a strong participation in EU projects. Strong emphasis will be given to increase the number of first class publications in high-ranking journals. Not only the participation in

international conferences is increased but IOS is also already reversing the brain drain of young researchers leaving Latvia by generating professional potential for them. The collaboration with industrial partners within Latvia and outside will be increased.

Conclusions and recommendations

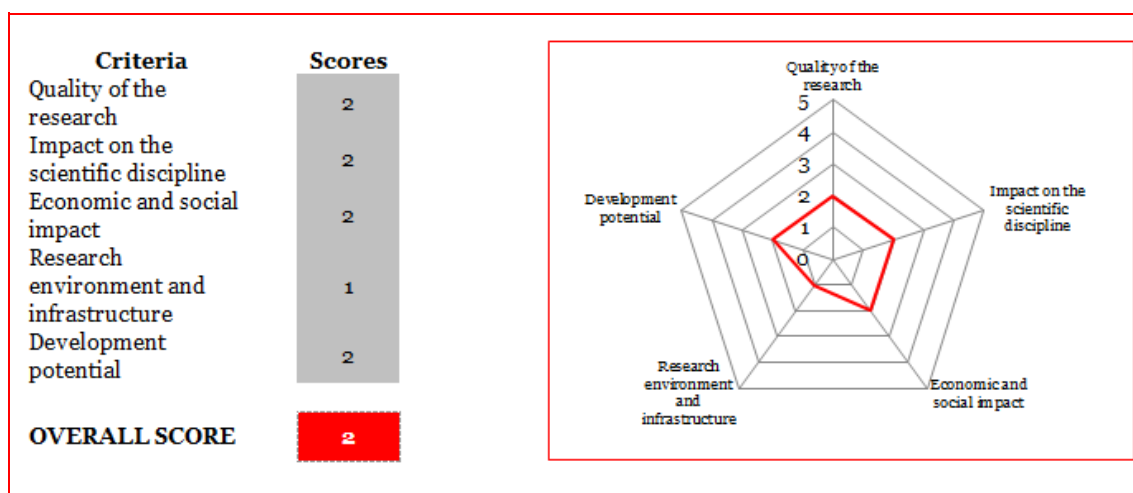
Without doubt Latvian Institute of Organic Synthesis is the leading institution in its field in Latvia and also well recognised internationally. It is still intended to increase the international visibility. Regarding the age structure of researchers there is a reform to increase the proportion of young scientists. Regarding the budget due to the low contribution from the state, if the size of the Institute is taken into consideration, the Institute is forced to attract money by research grants, in particular with the EU, and contracts with capital risk investors and the industry. The IOS is a nugget that deserves to be strongly supported by the Latvian government.

3. L_03_Latvian Institute of Aquatic Ecology

Name of the institution	Latvian Institute of Aquatic Ecology
Name of university	Latvian Institute of Aquatic Ecology
Type of institution	SSI

Latvian Institute of Aquatic Ecology (LIAE) is a state-owned research institute performing monitoring and research on aquatic environment in Latvia. It was established in the 90s as an independent research unit and then a part of University of Latvia. The Institute in its current form operates from 2007-2009. LIAE is a very small research institute not reaching the critical mass required for performing high impact research and monitoring activity in the field of environmental sciences. Total staff number of the institution is very small.

Figure 3 L_03 – Scores



Overall Score

The overall performance of Latvian Institute of Aquatic Ecology is rather average. It is considered as a Satisfactory National Player in terms of research quality, impact on the discipline and social impact. 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 vie for its status as a recognised member of the discipline; its impact on the international scientific community is undetermined. The development potential of the Institute is limited due to insufficient research infrastructure, lack of stable financing for environment monitoring activity performed by the Institute and lack of PhD students. Institute does not provide an appropriate environment for PhD students. The size of LIAE as a research institution conducting environmental monitoring and research on aquatic environment is not appropriate. It is simply too small. Especially research on marine environment requires substantial resources and collaborative affords. The long-term strategic and financial planning of the Institute requires investments and combining forces with other national or international institutions to get appropriate critical mass and resources.

Quality of Research

Latvian Institute of Aquatic Ecology (LIAE) is a very small research institute concentrating on the aquatic ecology as the main research area. The amount of the

research outputs is very limited. The number of real publications with higher impact factors is small, according to the data analysis 1.7 per researcher within 6 years. Most of the co-authors are from countries around the Baltic Sea. Some fundamental work on nitrogen fixation has mainly authors from other countries. The quality of the research is at low level. The work published in low rating scientific journals with low international recognition exemplifies not good quality of research. No modern research approaches in aquatic environment studies is applied in the Institute's research. The main efforts are towards monitoring of aquatic environment close to Riga. Although the Institute is involved in some international collaboration the range of those is limited. Also, results of conducted studies have limited importance for science. Low impact of publications expressed limited importance of obtained results. The Institute's basic research is concentrated on monitoring of the local environment conditions. Therefore, it could be considered only as Satisfactory National Player.

Impact on the scientific discipline

Latvian Institute of Aquatic Ecology (LIAE) conceptual objective is to contribute to the development of the environmental science in Latvia and promote the sustainable use and management of Latvian territorial and economic zone waters. That strategy results with LIAE scientific impact predominantly oriented towards the national scientific community. The Institute's strategy limits its influence on global science and scientific discipline. The small number of internationally recognised work published in a very good international journals limits impact of the research conducted in LIAE. Regarding the international scene the impact of the Institute is small. With respect to international cooperation 5 joint projects are listed (Estonia, France, and Finland); however, within the assessment report the results are not given. The Institute's research infrastructure does not allow for the substantial contribution into international global research project on marine aquatic environment in Baltic Sea or elsewhere.

Economic and social impact

Since the central LIAE activity is the environment and the protection of it, the research conducted at the Institute should be important for society. By publishing reports on marine environment quality, taking part in broadcasts on the conditions and tendencies in the Baltic Sea and the Gulf of Riga, the Institute is somehow involved in promotional activities. LIAE investigations have been used in the development of regulatory acts in the Ministry of Environmental Protection. In a few cases LIAE was involved in giving advice to the private sector about the marine environment. Since the extent of the investigations conducted at LIAE is limited, the influence of the Institute on the public and the importance of the Institute's activities on the society are also limited. Limited involvement in a big, global environmental programmes, lack of extensive collaborations on international level, limited coactivity with enterprises, as well as not complete, extended promotion programme of outcomes are limiting factors for the more pronounced role in society. The Institute has no impact on the higher education system since a very limited number (2) of PhD students conduct their research based on the Institute's infrastructure.

Research environment and infrastructure

Insufficient funding from the government is a serious issue in particular for long-term planning. Regarding a potential participation in EU-funded projects it is stated that this is limited due to current technical capacity and incapability to ensure a respective level of quality. The size of LIAE as a research institution conducting environmental monitoring and research on various aspects on environment is too small. Research on aquatic, marine, environment requires substantial resources and technical support. It is not clear what is the long-term strategic and financial planning of the Institute. A lack of appropriate research vessel and adequate research laboratories and equipment, limits the Institute's activities and internationally oriented collaboration. The Institute is rather a Poor National Player in the process of creating an appropriate research environment. No environment at all is provided for PhD programme. The stable long-

term funding for infrastructure and research has to be provided to conduct long-term monitoring of aquatic environment.

Development potential

Latvian Institute of Aquatic Ecology (LIAE) has to work hard to establish itself as a notable institution in its discipline within the foreseeable future. Future development would not be possible without substantial investments in infrastructure and consolidation with other Latvian institutions conducting similar research or having expertise that can be used in aquatic studies. The human resources including the number of research staff and the involvement of students in research is a limiting factor for the future development. A generation change within the personnel may both create a difficult situation but also open new opportunities for the future. The strategy plan for future is not clear. Despite the difficult financial situation new strategies with respect to research are needed. To develop international recognition the modern approaches in biodiversity analysis that involve genetics and population study are required.

Conclusions and recommendations

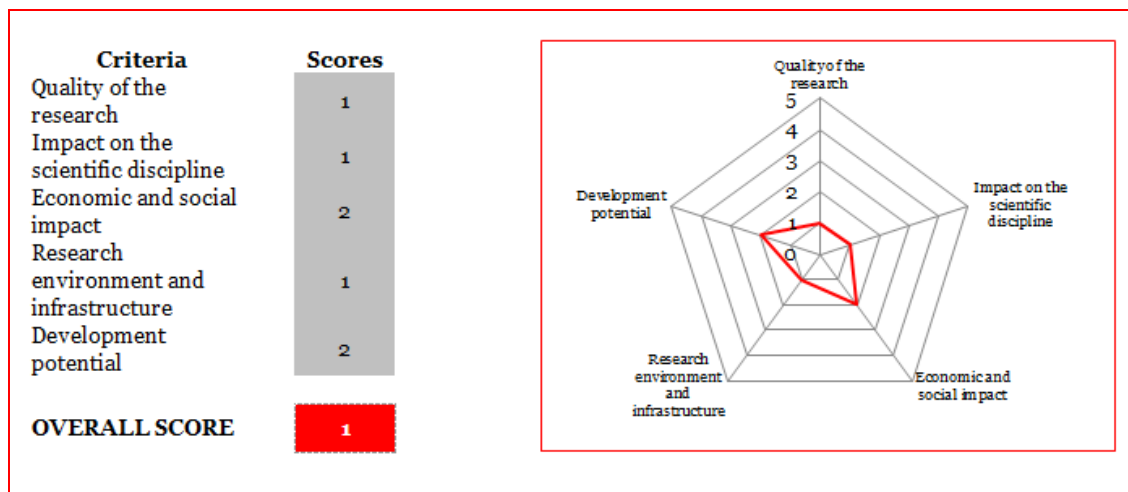
- LIAE planning needs to be more efficient as there seems to be no big plans for research at the moment and for the foreseeable future. There is a great need for a good strategy and plan.
- Mixed nature of the Institute, i.e. monitoring and research, is both a strength and a weakness. Monitoring part is not funded well but has to be performed. As a result, whatever small money this Institute gets for research goes to cover monitoring costs. Governmental financial support for monitoring duties is obligatory.
- There is a strong need to improve environment for PhDs (especially when there are not so many of them).
- This Institute is small, thus missing a critical mass in their research personnel. Perhaps there is some rationale for combining their efforts with the Food Safety, Animal Health and Environment “BIOR”.

4. L_04_ Latvian Academy of Sport Education

Name of the institution	Latvian Academy of Sport Education
Name of university	Latvian Academy of Sport Education
Type of institution	HEI

The Latvian Academy of Sport Education (LASE) is the only higher education institution in Latvia in the area of Sport, Exercise and Health Sciences. The Academy has a long history and tradition of pedagogy and physical education training in Latvia with a recent transformation towards modern sport sciences that was facilitated further by the official recognition and affirmation of Sport Science as a separate and distinct scientific discipline branch by the Latvian Council of Science in 1998. The main functions of LASE are to carry out research in Sport Sciences as well as to train the sport and physical activity teachers and specialist scientists. It is one of the largest units in Latvian Universities with approximately 70 academic staff in 2013 and 1250 students in undergraduate and graduate programs (including 26 PhD students). The LASE Sports Science Centre coordinates the research activities of the seven Research Laboratories and two Centres, most of which have been established in the last 2-3 years. However, the infrastructure and research facilities and equipment in most of the laboratories are quite basic and outdated and do not allow high quality research at an international level to be conducted. The volume and quality of publications are limited compared to other similar sized institutions and the majority are published in local journals or the journal edited and published by LASE. The institution is organising a large number of local conferences and events and collaborates with similar institutions in other Baltic countries, but its international presence and visibility in Sport Sciences is very limited.

Figure 4 L_04 – Scores



Overall Score

The overall research performance of the Latvian Academy of Sport Education is below average compared to international standards. The quality of the research and publications in high quality international journals are limited and the majority of outputs are published in local or internal journals. The impact of the research on important and current issues in the academic discipline is also very limited although there are dissemination and networking activities in the local geographical area of the

Baltic States. The economic and social impact of the institution is mainly related to local companies and the educational provision. The research environment and infrastructure require substantial improvement and development to become comparable to international standards. The future research and development strategy for the institution must be clearly focused on a few areas of research strength and expertise only. It is also necessary to improve the research facilities and quality of work through high quality national and international collaborations and external funding.

Quality of Research

The research areas covered in LASE are very wide and include Health and kinesiology; Top (performance) sports; Psychological preparedness and sports; Recreation and environment in the development of human mental and physical abilities and Sustainable sport education. However, the quality of research is limited compared to international standards in this field, especially given the large number of academic staff, researchers and PhD students. There are very few contributions to current international research issues and agendas and the institution is mainly a national level player. Both the quantity and the quality of the publications in high quality international journals are limited. With only a few exceptions in certain areas (disability sport, ageing and physical activity) the majority of the research is published in local journals only or journals that are edited and published by the department itself (LASE Journal of Sport Science). The department recognises that the research infrastructure is limited but the large number of research laboratories are not linked clearly with the main research themes and lead to separate groups without critical mass. Importantly, the institution appears to be content with the inward looking and institution-based research activities and there are no major collaborations with any of the other local institutions in medicine, biosciences or health sciences.

Impact on the scientific discipline

The impact of the research by the institution on the development of the scientific discipline is very limited and is predominantly focused on the national or local geographical area only. There are some local conferences and other dissemination events for PhD students and young researchers and the institution is very active in the promotion of sport science within the Baltic States. Baltic Sport Science Society conferences are organised with attendants from neighbouring countries so there is some influence at a national and local level. However, the impact of the research at an international level is fundamentally limited as indicated by the low number of research outputs and their limited citations. This is most probably due to the quality, depth and rigour of the research work of the institutions that need to be improved.

Economic and social impact

The research area is very important for society and especially some of the research on aspects of physical activity and ageing and disability sport has the potential for significant social and economic benefits. The economic and social impact of the research is satisfactory at a national and local level and there are also links with the Latvian Olympic Unit. The institution is very active in the education and training of students in these important areas. There are also a few collaborations with some companies in Latvia and several institutes in neighbouring European countries. However, there is no specific economic activity or impacts identified from any collaboration with commercial partners. There are no major collaborations with relevant government or public bodies or committees related to policy in sport or physical activity and public health.

Research environment and infrastructure

The research environment is developing but it is not comparable to international standards. There is a large number of laboratories and centres but the infrastructure and research facilities and equipment in most of these laboratories (apart from the Lab in the Olympic Unit) are quite basic and will have to be updated to allow any high

quality research at an international level to be conducted. Although the research environment and infrastructure are still evolving, there is no clear strategy or direction for the development of the research. A clear research strategy and plan is necessary to improve the research facilities and quality through high quality national and international collaborations and external funding. The large number of academic staff and PhD students is a positive aspect of the environment although the large number of research areas and laboratories means that there is fragmentation of effort and lack of critical mass of young leading researchers in particular in some areas.

There are research training activities and some opportunities for research skills development through the participation of young researchers and PhD students to the local conferences and summer schools organised. However, the research output of their work is very limited and there is no strong evidence of joint publications with supervisors in international journals from their PhD research work.

Development potential

The development potential of the institution is good as it has the capability to strengthen its national position and make some international contributions in the future, especially given the large number of academic staff and researchers. However, the institution needs to work hard and concentrate on some limited areas of strength and expertise to establish itself as a notable international player. For this to be successful there needs to be a well focused research strategy and strong research leadership. The development plan must be based on research themes that are focused on the strengths and expertise of the institution and be better linked to the laboratories and infrastructure. These issues need to be addressed to improve the funding levels, and the quality of the environment, the research outputs and the impact of the institution.

Conclusions and recommendations

The Latvian Academy of Sport Education (LASE) is the only higher education institution in Latvia in the area of Sport, Exercise and Health Sciences and, therefore, has an important role and mission in Latvia. However, there are significant improvements required in order to develop its potential, increase its research work quality to international standards and make notable contributions to the academic discipline, the economy and society. The key recommendations for improvements are:

Develop clear strategic aims that are outwardly and internationally focused and concentrate efforts on a few areas of research strength and expertise only

Develop research links with world-class and internationally renowned institutions in the Baltic and Scandinavian countries as well as relevant institutions in Riga.

Improve the research facilities through increased government and external funding

Target international journals with high quality research work to increase international visibility and contribution

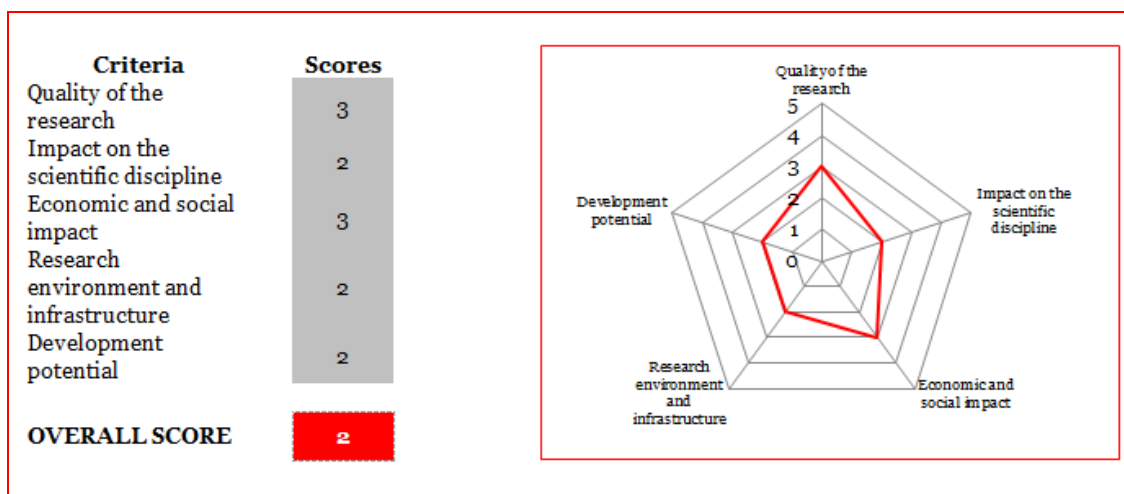
Provide high quality research training and experience for PhD students by collaborating with strong research units in Riga and other international institutions.

5. L_05_Faculty of Biology

Name of the institution	Faculty of Biology
Name of university	University of Latvia
Type of institution	HEI

The Faculty of Biology, University of Latvia (FB), is the largest and the most diverse education institution in biological sciences, in Latvia. Its aim is to provide education at bachelor, master and doctoral levels in most fields of biology. They list 18 different research fields in the Self-Assessment Report (SAR) that are covered within 7 departments and two additional structural units. The number of employees listed in the SAR is around 40 and the full time equivalents for scientific research (FTE) is around 25, meaning that there are on average around 3 FTEs per department/structural unit. During the most recent years the European Social Fund (ESF) and the European Regional Development Fund (ERDF) projects have been carried out at the FB, increasing the number of staff involved primarily in research projects, which was a rarity before. These grants are coming to an end and according to the information received funding possibilities for new research projects are scarce.

Figure 5 L_05 – Scores



Overall Score

One of the main reasons for a low overall score is due to the lack of constructive vision for the research part within FB. There is a lack of joint vision for the future development of the Faculty and there is also a lack of clear vision for the research part within each department. Another main reason for a low score is the current research environment within FB. It is of low quality and should be renovated to create a more productive research environment and of a higher international standard. The third main reason is the foreseeable low future funding availabilities for new research projects within the Faculty.

Quality of Research

Considering the relatively low FTE number the scientific activity within FB is high. The number of publication per FTE is >10 and about 60% of the personnel holding doctoral degrees have one or more publication per year. The average number of citations per publication is good (about 5 when corrected for self-citations) and also

the number of PhD dissertations. The quality of the publications submitted with the SAR is high. But the ones with the highest citation number and/or published in the journals with the highest impact factors (IPs) were either or both including only one author from FB out of many, and/or the research was mainly conducted within collaborating institution(s). The research fields covered by FB are very numerous (18 listed) and due to low FTE numbers the contribution on an international level and in collaboration projects is most often small. The level of international involvement, number of international collaboration projects and original projects published in international journals with good IPs varies considerably between the different subunits. However, in general most if not all the FBs' departments do well on the national level.

Impact on the scientific discipline

FB occupies a stable and important position in the national scientific community as an educational institute with research activity. It has a large number of departments with variable research quality. The largest weakness is the low FTE number within each unit, not reaching the necessary critical mass for high-level research within FB resulting in high enough impact publications. The existence of each department in regards to scientific objects should be strongly presented within a strategic plan for FB as an identity, including clear scientific aims and measurable milestones. The position of the Faculty within the international scientific community seems to have the potential to evolve further, in particular if the teaching load of the employees could be lessened and a more research-minded culture developed, within the Faculty.

Economic and social impact

FB is a very important educational institute in Latvia and it produces PhDs within fields where they are in need, these same fields being important for the economic and social development within Latvia. Research at FB is of a wide spectrum, it is of importance for the Latvian society and it has in some cases a high national economic or social impact, such as the studies on forest ecosystems where FB is leading nationally. Studies by the personnel at FB on soil and environmental microbiology have resulted in practical applications in Latvia within agriculture, bioremediation and sewage treatment. The personnel's active participation in environmental protection activities is also of importance.

Research environment and infrastructure

Organisation and the management of FB appear to be good. However, the educational part is extensive and the main effort of the management team and employees is to withstand the present level of teaching within the Faculty, placing research in a weak second priority. The goal orientation of future research work is not clear, except to preserve the high number of research fields and departments (Chairs) within FB. All the departments are small and hardly reaching critical research mass. If the research part of the Faculty is to evolve further the number of research minded scientists of high international standard with international connections must be increased, as well as the quotient (FTE) that current employee can devote to research projects and scientific activity. The research environment within the Faculty is of very low quality. The Faculty is located within a very old building with extremely poor maintenance and in no way streamlined for efficient modern scientific institution. The majority of the space is used for the Faculty's educational purposes and the space for research is minimal. In many cases the Faculty itself is not well equipped but availability of research equipment and support services to the scientists at FB is good, thanks to the access policy between institutes in Latvia. The ratio of PhD students involved in research, versus FTE number, is high, but only a minority of them are able to perform their research within FB's buildings. This is a hindrance for any effort to establish critical research mass and to create a strong research-minded environment within the Faculty. The long-term strategy of the Faculty of Biology and the financial resource planning is lacking but the uncertainty of future possibilities of available grants and other funding can probably explain it.

Development potential

The developmental potential of FB is uncertain. The current size of most of the research units is too small. FB should, however, be able to remain a strong national player within its fields of research. FB departments will also continue to contribute occasionally to activities of the international scientific community. If something more is to be expected of FB, considerable changes of the research environment as a whole are needed including increasing the number of employees of high international standard and the quotient (FTE) that current employee can devote to their own original research projects, as well as increase funding abilities.

Conclusions and recommendations

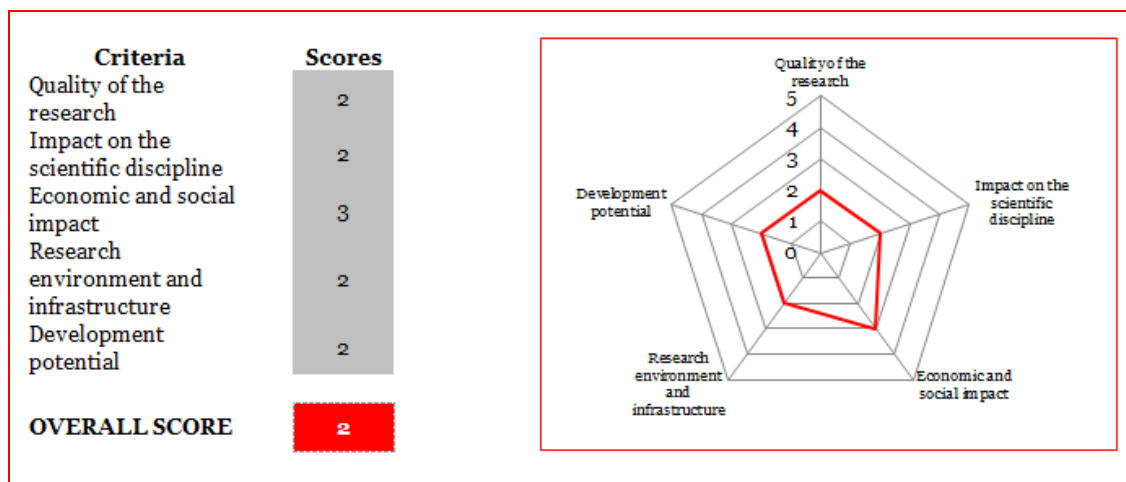
To increase the development potential of the Faculty, the research environment needs to be taken into serious consideration. However, it is not enough just to have a larger and better building, more of new and up to date equipment and more funding availabilities, although all three are very necessary in the case of FB. Motivations to increase the number of original research projects of international standards where FB researchers are in the leading positions are a must. Motivations to increase the ambition to become stronger players at an international level are also a must. The aim should be to lessen the teaching burden of the current employees and increase the time they can devote to research. It is also important to increase the number of young high quality research scientists with a good international scientific background, and with good international connections to high quality research institutes. Post-doctoral research positions should be created. A greater mobility of researchers at both junior and senior level should be encouraged and promoted allowing longer period of visits and experimental work for stimulating publications of high impact and increasing the general quality of research achieved. Improvement in this direction was noticed in year 2012 and is a positive sign.

6. L_06_ University of Latvia Faculty of Medicine

Name of the institution	Faculty of Medicine
Name of university	University of Latvia
Type of institution	HEI

The Faculty of Medicine (FM) is a relatively new unit of the University of Latvia, re-established to full functionality in 1998. Its main aim is to provide education to medical professionals (doctors, pharmacists, nurses) both at graduate and postgraduate levels. The number of employees listed in the SAR is around 70 and the number of full time equivalents (FTE) for scientific research is around 56, many of which have affiliation with one of the clinical hospitals in Riga. The research facilities of the FM are rather limited to a few disciplines. They are located within an old building and a significant quantity of the new equipment purchased from the EU structural funds has neither been installed nor used for reasons unknown but probably due to the inadequacy between projects (or even lack of projects) and equipment, lack of adequate space, human resources and credit for consumables. Hence, most of the current research activities of the FM staff is being performed either at the premises of the associated Clinical Hospitals or at the Latvian Biomedical Research and Study Centre, Institute for Organic Synthesis or other faculties of the University of Latvia. The new National Science Centre of the University of Latvia, which is under construction and will be completed by 2014-2015, should hopefully unite most of the research capacities of the UL, including the one of the FM. The research funding from local sources has been the lowest among other Latvia Institutions, which has affected this institution research output.

Figure 6 L_06 – Scores



Overall Score

The low overall score of the FM is due to the fact that it is a relatively new institution which is slowly building its portfolio under a very restricted environment, relatively modest research output which is primarily of national visibility, lack of structured developmental plans, impression of a minor impact on clinical research performed independently at the associated clinical hospital and lack of current/forthcoming funding for research activities both from national and international sources.

Quality of Research

This is a relatively new institution that is starting to develop its international research portfolio. As such, there is a considerable discrepancy in the outputs of the research groups. About 40% of those listed as academic or academic research personnel during 2006-2011 did not have a single publication during this period. Less than 40% had one or more publications per year in that same period. With the exception of 2 groups with an exceptional research output, most other leading researchers publish papers in relatively low impact factor journals or local journals. Funding is extremely modest (4.8M euro for 6 years), 60% of which is from two international projects that are finishing by the end of 2013. The number of PhDs is rather low considering that FM's main functions are education and research.

Impact on the scientific discipline

FM has an important position in the national scientific community as an educational institution with research activity. However, there is a considerable difference in the impact of various research groups. A number of FM's personnel are among Latvia's most prominent scientists within the field of medicine and they have a considerable impact on the development of the scientific discipline even on an international level (e.g. cardiology). It is, however, difficult to give FM too much credit for this since many of the most successful projects are conducted outside FM premises, primarily within clinical hospitals and within other Latvian institutions where the scientists are also affiliated. The investments made in new equipment from the EU structural funds have not provided a full research benefit and educational outputs since a large part of the equipment has not been used as yet. Doctoral dissertations are around 4 per year and that is rather low for an institution with such a high number of qualified academic personnel and a high FTE number (> 50).

Economic and social impact

Given the wide impact of medical research, the impact on society issues is substantial. The major contribution of FM is through graduate and postgraduate education in various subjects of medical sciences. The research performed by scientists affiliated at FM is very important for the Latvian society, but it is mainly conducted outside the premises of FM. The same applies for interactions with non-academicians.

Research environment and infrastructure

Due to a scarce research infrastructure, research activities are primarily performed within the clinical hospitals or collaborating institutions and it appears that they are conducted with only a minor (if any in certain instances) influence from the environment of the FM. The research teams within the basic disciplines are relatively small and underfunded and appear not to reach the critical mass necessary for the establishment of international recognition. With several notable exceptions, the international collaboration is limited; in particular, the exchange programme for young scientists is rather neglected. The current research infrastructure is relatively poor, although certain departments have obtained modern equipment, which, unfortunately, is not fully operational due to spatial limitations. The priority areas for research are primarily based on the current human resources (scientists originating from the Institute of Organic Synthesis or Biomedical Research and Study Centre) and not on structured developmental plans, which can be due to the uncertainty of future availability of national research funding. The clinical research is conducted within the hospitals with little (if any) input from the FM, and together with a low number of PhD students is a hindrance for any effort to establish critical research mass and create a strong research-minded environment within the Faculty.

Development potential

The developmental plans of the FM are rather broad and unstructured. A limiting factor for development has been the low budget funding in the previous period, and there are very few international and national projects that were/are being funded. It is to be expected that the FM will remain a strong national player within certain

disciplines and that the completion of the new research centre for biomedicine and pharmacy will create a necessary upscale in the research environment. Closer collaboration with other institutions within and outside the country that have a long-standing history of established research in the medical field is a necessity. The educational exchange programme for young scientists should be given a priority.

Conclusions and recommendations

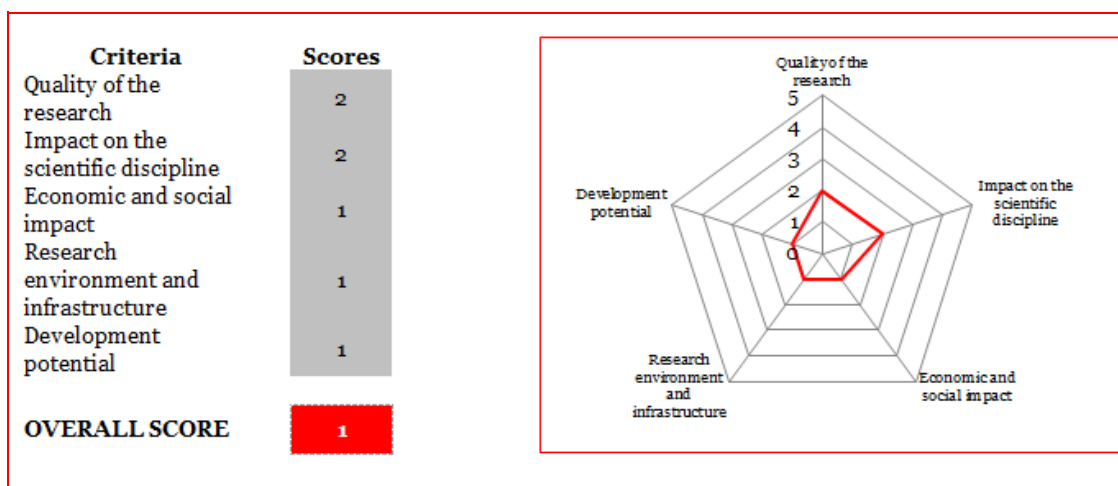
The Faculty of Medicine is a new unit that still has to develop its potential. A special attention should be given to the development of its identity in the current and future clinical research performed at the clinical hospitals, development of the research environment by strengthening the links with the prominent national research institutions, establishment of a project-related collaboration with prominent international institutions, building up on good practices from other institutions in Latvia on collaboration basis with prominent Latvian scientists working at prominent institutions in EU/USA, provision of stable long-term financing of research activities and clear vision for mid- and long-term development of research activities including human resources.

7. L_07_Institute of Experimental and Clinical Medicine

Name of the institution	Institute of Experimental and Clinical Medicine
Name of university	University of Latvia
Type of institution	HEI

Institute of Experimental and Clinical Medicine (IECM) is one of the several Institutions within University of Latvia. It is a very small Institute with a limited number of personnel and a low number of full time equivalents dedicated to scientific research (FTE) with very wide research topics such as 1) blood flow and metabolism; 2) resistance of cancer cells, morphology; 3) lung research; 4) neuroendocrinology of metabolism; 5) osteopencsotherapy; and 6) osteoporosis.

Figure 7 L_07 – Scores



Overall Score

The low overall score is due to the lack of enough successes at the international level observed in the last few years and how unlikely it is to happen under current situation and future prospective.

Quality of Research

IECM is a satisfactory national player with a good number of outputs for the period 2006-2011 and with an average number of citations per publication corrected for self-citations of 4 to 5. However, the number of original papers published is very low considering the total number of academic research personnel during the assessment period. Interestingly, the number of doctoral dissertations is good considering the low FTE number of leading researchers and the small size of the Institute.

Impact on the scientific discipline

The Institution occupies a stable position in the national scientific community. However, the impact IECM has had on the development of their numerous fields of interest is low. However one emerging topic: “Assessing the role of novel risk factors for insulin resistance in Latvia, and introduction of modern diagnostic tests in clinical practice in Latvia” is worth to be noted.

Economic and social impact

Participating in the introduction of modern diagnostic tests in clinical practice in Latvia can be attributed to IECM but without interaction with non-academics.

Research environment and infrastructure

The Institute research environment and infrastructure seems to be of a low quality and the long-term strategic plans do not exist. Explanation for this may be found in the SWOT analysis provided by IECM in which the main weaknesses and threats stressed the lack of qualified personnel, irregular financial support in terms of project awarding and duration, as well as the too short mandates financing wages and of infrastructure. The Institute is most likely too small to be able to create an efficient research environment.

Development potential

Although some of IECM's science projects sound interesting and innovative (i.e. the research project of using artificial smell detector for early detection of lung cancer and the project of using tumour cell model systems to analyse the appearance of microcells as a result of anti-cancer therapies), the Institute does not have the needed critical mass to ensure success. Their future vision is also unclear. IECM would need to work very hard to be able to establish itself as internationally recognised. It would maybe be worth to consider merging with another comparable Institution in Riga, in an effort to create more efficient research environment and an infrastructure of higher quality.

Conclusions and recommendations

IECM is a small Institute unable to cover the too many and too broad research fields they described. Merging with another institution in Riga should be considered on a voluntary base after discussion and research personnel agreement. A strong leadership animated with high research motivation should also be implemented to reach a higher research level.

8. L_o8_Institute of Cardiology

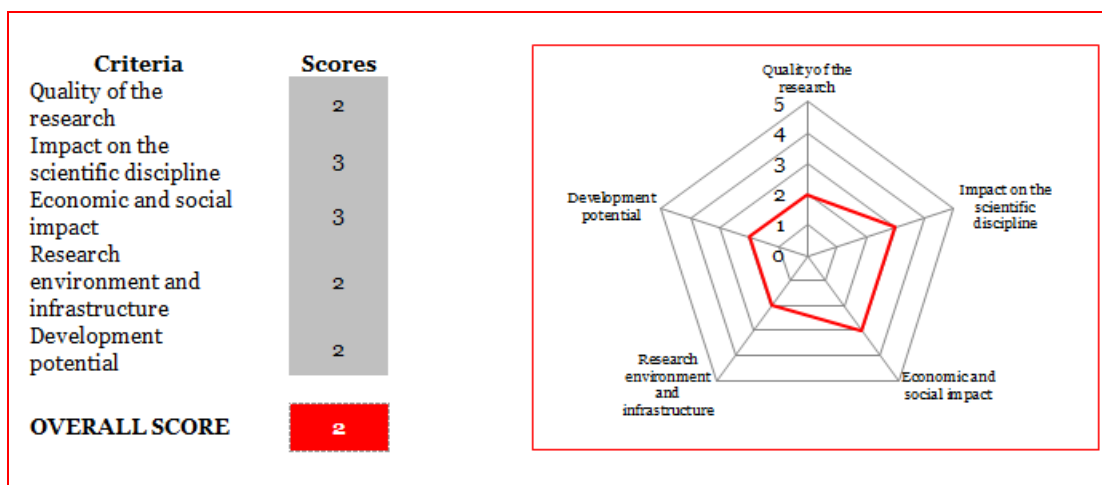
Name of the institution	Institute of Cardiology
Name of university	University of Latvia
Type of institution	HEI

The Research Institute of Cardiology (RIC) of the University of Latvia is a small, specialised research unit with approximately 12 researchers and with the total number of staff declining since 2006. The main research fields include: Atherosclerosis of coronary and peripheral blood circulation; Invasive cardiology; Epidemiology and prevention of cardiovascular diseases; Gene polymorphism for the estimation of coronary heart disease; Secondary risk factors of cardiovascular diseases

The institute is recognised internationally mainly through the work of the current director and leading researcher who is very active in participating in important international research projects and networks with a strong record of high quality publications. These outputs have attracted a very high number of citations internationally and this is a strong indication of the impact of the work and its influence of the academic discipline, the practice of invasive cardiology with innovative treatment methods and the primary prevention of cardiovascular disease. These achievements are based on the work of the main leading researchers and the low number of researchers in the unit is a threat for its future development.

The institute does not have any major facilities and most of the work is being conducted at the hospital (PSCUH), where some of the researchers also belong. Their work is also assessed as part of the other units based in the hospital and the PhD students working at the RIC are also registered and based for some of their time in the other medical units. The small critical mass of researchers at the institute, together with the reduced funding and joint infrastructure are major threats for the future. However, there is strong leadership and clear strategic development plans for future research on important areas of prevention, diagnosis and treatment of cardiovascular disease so support to grow or become part of a larger medical institution or research unit is essential.

Figure 8 L_o8 – Scores



Overall Score

The Research Institute of Cardiology of the University of Latvia is a small unit specialising in cardiology research and has established itself as a very strong national player within the field of Cardiology. The director of the unit is an outstanding researcher with an extensive record of high quality publications with the highest citation index in the country and very important contributions of academic knowledge and cardiology practice. However, a low critical mass of active researchers and PhD students, joint infrastructure and a decreased level of funding affect the overall record of research. These are serious concerns that threaten the future potential of the institute, despite the focused strategic research plans outlined.

Quality of Research

Despite the fact that RIC is a small institution, a good number of successful research projects have been performed. The results of some of these research projects have aroused strong interest in the international academic community. Papers of high quality have been published in international journals with high impact factors. Noticeable though is the seemingly wide gap between the standard of the scientific output of the different research leaders within RIC. It seems that most, if not all the publications contributing to the high international standard, are from projects led by one of the seven leading researchers affiliated at the institution. The low number of PhD students is also of concern, especially since the PhD students are registered in other units and spend only a fraction of their time in the RIC. The number of current medical doctors working on their doctoral degree and linked with RIC is higher so the doctoral completions should improve in future years.

Impact on the scientific discipline

The Research Institute of Cardiology is internationally recognised and one of the affiliated leading researchers is very active in participating in international research projects and networks. It is a particularly strong player within the Baltic and the Nordic-Baltic networks and he is frequently one of the main authors of publications of large collaborative studies at multinational level. Although the total number of publications is modest, the total citations of the published research work are amongst the highest in Latvia. The impact of these outputs is significant and in terms of average number of citations per Scopus output, RIC is ranked as one of the top institutions in Life Sciences and Medicine in Latvia, with by far the highest number of citations per output (N= \sim 30) compared to all the other top institutions in Latvia (N= \sim 10). Although this is based on some specialised work in the Institute, it shows that there is significant impact and recognition of this work internationally.

Economic and social impact

The research performed at RIC is of high importance for the society. High quality research projects that aim to monitor public health are very important when it comes to public policy planning. The research performed within RIC is therefore very important for the Latvian policy-makers as well as the Latvian public. Interaction of the Institute with the public and public organisations is extensive (e.g., The Latvian Society of Cardiology and Latvian Physicians Association), the main aim being regular educational campaigns and alerts for “heart health”. Extensive memberships of the affiliated scientists in editorial boards of scientific journals, as well as scientific advisory boards that are not primarily of academic nature, is also noteworthy. There are also important collaborations with international partners in the Nordic countries for a series of studies with important outcomes and implications for cardiology practice internationally. This is also reflected in the large number of invited presentations of the leading researcher.

Research environment and infrastructure

Overall, the management of the research at the institution, the long-term strategic planning and development strategy and the goal orientation of the research work seem very good. However, the infrastructure and the research environment within the

Institute seem to face serious threats due to lack of funding. Firstly, the relatively small size of the Institute is of major concern. Secondly, the decrease in the FTE number of leading scientists, during the evaluation period, is very worrying. This number of FTE has decreased more than 3 fold, from being 9 to less than 3. These two factors alone are alarming enough to create serious doubt about the quality of RIC's current research environment and its infrastructure. Furthermore, the description of the current research environment and infrastructure is not very clear and there are inaccuracies in the information about specific infrastructure items and number and completions of PhD researchers as well as research support. The overall external funding is also low compared to other institutions in medical or biological areas.

Development potential

The Research Institute of Cardiology of the University of Latvia has established itself as a very strong national player within the field of Cardiology, which is a very important research field. Large health related data sets and research data has been collected through previous research projects, and they can be of great value as a base for future research in the field. A high quality international research environment has also been created in the past few years, but seemingly mainly through a research group led by one scientist of high international standard. The developmental potential of RIC will therefore heavily depend on the continued contribution and dedication by this scientist and his group. RIC's developmental potential depends also heavily on its ability to increase its size and to increase the FTE number of leading researchers with strong international scientific background, and connections. The current size of the institute, therefore, is a serious threat for further development potentials. Although this small critical mass of the institute is a threat, there are clear development plans for research on important areas of prevention, diagnosis and treatment of cardiovascular disease. This provides a very good future development potential for the institution if it was supported to grow or became part of a larger medical institution or research unit.

Conclusions and recommendations

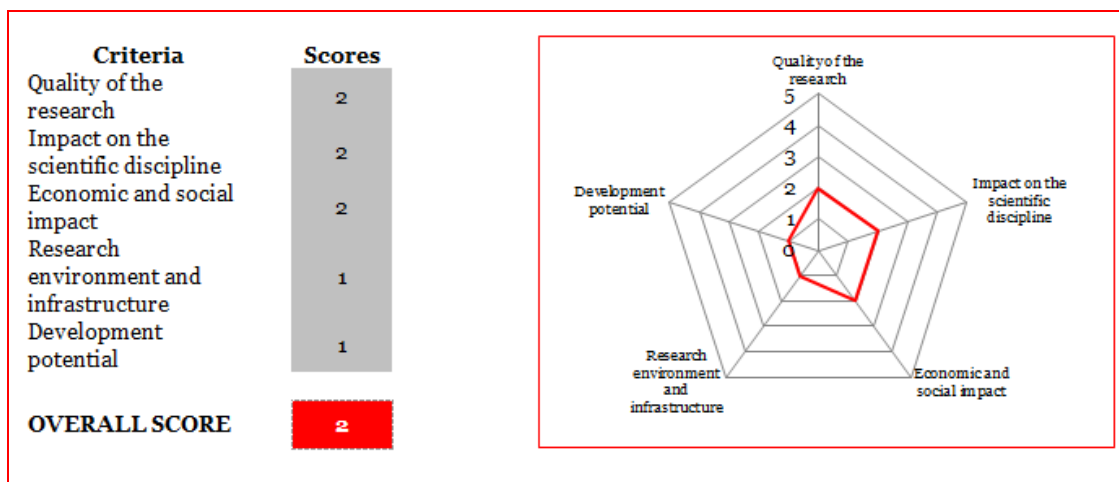
The Research Institute of Cardiology of the University of Latvia is a small, specialised research unit that performs important research in cardiology. The institute relies on the hosting hospital for its infrastructure and is directed by a very experienced researcher that has driven the institute and its significant achievements in research outputs and impact. However, in comparison with the overall life sciences and medicine field, this research performance of the unit as a whole is lacking in several aspects. The main recommendations are to address the critical mass issue through significant funding and consider a merger with a relevant larger research unit in the medical faculty or the hospital based research framework.

9. L_09 Institute of Microbiology and Biotechnology

Name of the institution	Institute of Microbiology and Biotechnology
Name of university	University of Latvia
Type of institution	HEI

The Institute of Microbiology and Biotechnology (IMB) of the University of Latvia is a research institute focussed on microbial physiology, biotechnology and metabolic engineering, as well as on microbial biodegradation processes in the natural environments. The Institute possesses equipment and expertise in specialized methods in several niche areas of microbiology and biotechnology (e.g. FT-IR spectroscopy) and has developed important links and collaborations with European partners. The main research fields listed include: Metabolism, physiology and biotechnology of industrial producer microorganisms; Microbial biodegradation and environmental biotechnology; Food biotechnology. Bioenergetics, physiology, and metabolic engineering of ethanologenic microorganisms are currently the largest research areas of the Institute. Research is conducted in four main laboratories, each directed by an experienced researcher (cell biology, microbial storage polymers, food biotechnology and industrial microbiology, environmental microbiology).

Figure 9 L_09 – Scores



Overall Score

The Institute of Microbiology and Biotechnology has some unique competencies in niche areas of microbiology and biotechnology and has achieved a respected reputation and level of research in Latvia and internationally. However, the main efforts are directed towards maintaining funding for the different project teams and this results in a variable staffing base and relatively lower performance in research outputs and impact of the publications. The physical infrastructure of the institute is in desperate need of refurbishment and the move to the new building of the University is expected to improve the research environment dramatically. However, the funding for this type of work from national and state sources is variable and intermittent so the targeting of external European and international sources of funding are essential.

Quality of Research

The Institute of Microbiology and Biotechnology University of Latvia is a small research and postgraduate educational unit conducting research on microbial physiology, biotechnology and metabolic engineering, as well as on microbial biodegradation processes in the natural environments. It focuses on microbiology of producer organisms. The outcome of the investigations conducted in the institute is low reflecting the relatively low number of research personnel. The research is not published in highly rated international journals, which exclude the institute from being the global leader or strong international player. However, the obtained results are published in good international journals in the field of microbiology. The importance of research by the institution is unquestionable and there are extensive international links for various projects. The research plans of the different areas and laboratories are very well defined but they depend on future funding that is uncertain. The quality of the research has the potential to improve with significant investment in areas of research niche and experimental expertise and collaborations with top European and international institutes.

Impact on the scientific discipline

The institute is a respected national research centre but the relatively low number of papers published, and low number of citations per publication reflects the relatively low influence of the research work on the academic area and the fields of microbiology and biotechnology. However, the institute provides important contribution to the specific field of producer organisms with potential application in industry. The institution occupies a stable position in a niche area in the international scientific community, which is also reflected in the large number of international collaborations, visits and organisation of some international conferences. The Institute is also partner in several transnational projects funded by various European organisations. The number of students enrolled in Masters and PhD programs jointly with the Faculty of Biology is quite low and is also related to the lack of funding for postgraduate studies.

Economic and social impact

The Institute of Microbiology and Biotechnology carries out research in microbiology and biotechnology of producer microorganisms and is involved in little contract research for some local biotechnological firms. The technology and production of a polyfructane-containing powder from dried Jerusalem artichoke, was developed in collaboration with industry. Collaboration with other companies for biomass production is ongoing. However, the main focus is on basic research the number of patents applied for is small (about one per year). IMB is also involved in some promotion activities for the general public. The number of postgraduate students is low so there is only limited influence of the educational programs. No major collaborations with policy-makers have been indicated. The research of the institution is important for society and the institution's interactions with non-academics are at a level that is expected of academic institutions of a very small size.

Research environment and infrastructure

Although the basic research infrastructure, in particular analytical equipment, has been updated during the past 5 years, the institution's research environment is still evolving to achieve a level that is expected in the international scientific community in these fields. The current physical infrastructure and the buildings where the main laboratories are housed are inadequate and inappropriate for the type of work conducted. The Institute will relocate to the University's new facilities of the Tornakalna Academic Centre for Natural Sciences in 2014/15. This will be a very important enhancement of the physical infrastructure but there was no obvious engagement with the design or building processes to ensure that the laboratories are purpose built and adequate for the planned future research. The size (number of researchers) of the institute is small and requires enlargement due to the development strategy proposed to merge the traditional biochemistry and physiology with the methodology of metabolic engineering and systems biology. The research management of the Institute seems to be well organised. Regarding funding the

Institute has to apply for external sources, in particular from the EU. However, this project-oriented financing is problematic for long-term planning and stability. The success rate with local and ESF/ERDF funding has been high but with the discontinuation of these funding streams next year and the difficulty in attracting EU funding (especially without any preparation for Horizon 2020), the future of the project teams is uncertain. Unfortunately, neither microbiology nor biotechnology has priority within the Latvian research policy, contrary to international trends.

Development potential

The vision of the Institute after 5-7 years as a small, internationally recognised research centre specialised in the field of microbial biotechnology could be achieved. However, it requires substantial investment and clear emphasis of the development of particular research fields. Especially the development of modern methodologies of metabolic engineering and systems biology require investments in research equipment, laboratories and development of research staff. The strategy of the Institute traditionally following the 'bottom up' approach has to be adopted for the goals the institute would like to achieve. In the future, the institution could strengthen its position in the international scientific community with appropriate investment and government/state support.

Conclusions and recommendations

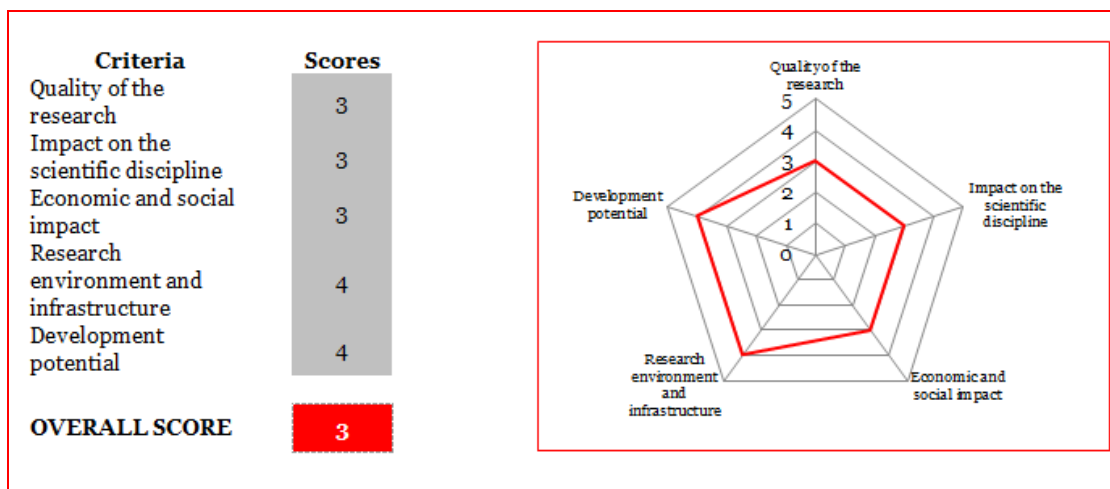
The Institute of Microbiology and Biotechnology of the University of Latvia is a small research and postgraduate educational unit conducting research on microbial physiology, biotechnology and metabolic engineering, as well as on microbial biodegradation processes in the natural environments. The institute has clear future goals for each of the main research groups and laboratories based on a "bottom-up" approach where researchers and group leaders in particular are expected to set up novel competitive research directions aligned with their research interests. Although it is believed that this scientific freedom and initiative of motivated researchers is more likely to lead to successful novel results compared to more generic research strategies and directions, it also carries the danger of intermittent funding and disruptions in the function of the research groups. The institute needs to develop a funding strategy and plans for the immediate future that can target these problems and collaborate or merge with other successful units to ensure the continuation of the activities of the main research groups through stable external funding. The Latvian State and the Council of Science also need to consider their funding priorities and mechanisms to ensure that core facilities are funded effectively and are able to continue their important research work.

10. L_10_Riga Stradins University Division of Medicine

Name of the institution	Division of Medicine
Name of university	Riga Stradins University
Type of institution	HEI

The Division of Medicine at the Riga Stradins University (RSUDM) has been the major educational institution (>80% of all graduate and postgraduate students) in the field of medical sciences in Latvia for over 60 years. With almost 100 FTE researchers, RSUDM is also the largest Latvian institution with research activities in various areas of medical sciences such as biomedical, clinical, regulatory and health systems. The RSU is currently amongst the top 3 Latvian Institutions considering research outputs such as patents. The basic research activities at RSUDM are primarily undertaken within its 5 institutes (Anatomy and Anthropology, Environmental and Occupational Health, Hereditary Cancer, Microbiology and Virology and Dentistry) and the laboratories of the clinical departments, whereas the clinical research is undertaken within one of the 3 associated clinical hospitals (Paul Stradins, Riga East and Paediatric Clinic).

Figure 10 L_10 – Scores



Overall Score

The overall score is based on the fact that RSUDM is one the major educational and research institution in Latvia with clear developmental goals, quality research infrastructure, research-minded environment, wide coverage of research in all medical fields, well established collaboration with all major players in medical sciences in Latvia, intermittent international visibility/recognition, but with low number of papers in ISI journals per researcher with low citation numbers.

Quality of Research

RSUDM is one of the top 3 institutions that receive the highest funding for research in Latvia; hence it is one of the most productive in research outputs with more than 1,800 publications in the period 2006-2011. The weaknesses being that most of these publications are in local journals, and the average number of ISI publications is

<1/researcher/year. As a consequence the citations are low (less than 6/publication). Several of the papers provided for evaluation are published in highly ranked journals within their respective field of medicine (NEJM, JAMA, Lancet etc.), resulting generally from an international collaboration in which the Latvian scientists have only a participating role. It is to be noted that since 2008 the RSUDM has established a Technology Transfer Department, which has proven instrumental in the increasing number of patents, some of which has reached the market stage.

Impact on the scientific discipline

The RSUDM is the most important Latvian educational institution having a major role in the development of all branches of medical sciences. Its research interests are wide and include all aspects of basic and applied medicine, dentistry and pharmacy, including translational medicine. RSUDM is the major institution for PhD studies in medical sciences with more than 100 completed PhD theses. In addition, RSUDM staff is extensively involved in various scientific and regulatory committees in the field of Latvian medical sciences. However, the major and internationally recognised developments are limited to the clinical research activities performed within the associated clinical hospitals, with little (if any) impact from the RSUDM infrastructure.

Economic and social impact

Being the leading educational institution that covers all fields of medical sciences, the economic and social impact of RSUDM in Latvia is high. RSUDM is also the leading Latvian institution for developing research-based evidence in medicine, which provides major input for regulatory authorities, expert panels and policy measures. The Technology Transfer Office of the RSU has been instrumental in the establishment of collaboration with the industry and development of new medicinal products through market-oriented research or contractual research. RSU is part of most important societal competence networks in Latvia.

Research environment and infrastructure

RSUDM is an institution with a long and fruitful tradition with clearly established research-minded environment in all subjects of medical research. The presence of almost 100 FTE researches under the umbrella of the RSUDM, numerous PhD students, clear developmental goals and plans, as well as the collaboration with major clinical hospitals provides the necessary critical mass for future development. The quality of infrastructure (buildings) was below standard in the 2 institutes that were visited (Microbiology and Virology and Hereditary Cancer), but the construction of new buildings was underway for both institutions. It appears that most of the research institutes of the RSUDM have contemporary advanced research equipment that should provide a sound basis for forefront research activities. However, the financing of research projects is low and is primarily based on local sources, which have been downgraded dramatically (~60%) since 2008. Funding from international sources is mainly from the EU structural funds, which provide funds for equipment/facilities, but not for sustained research activities, which was considered the major impetus for a higher level of research output in the recent past.

Development potential

The developmental potential of RSUDM seems to be high. It is the largest and oldest educational and research institution in the field of medical sciences in Latvia. The research environment and infrastructure for clinical research is/will be of a high standard. It collaborates with all major players within the medical field in Latvia, has clear developmental plans and sound management, which is exemplified by ISO 9001 certification. The research themes for future development are among the most promising in medical sciences overall, and as such will be a ground for a strong international competition which might provide challenging for successes.

Conclusions and recommendations

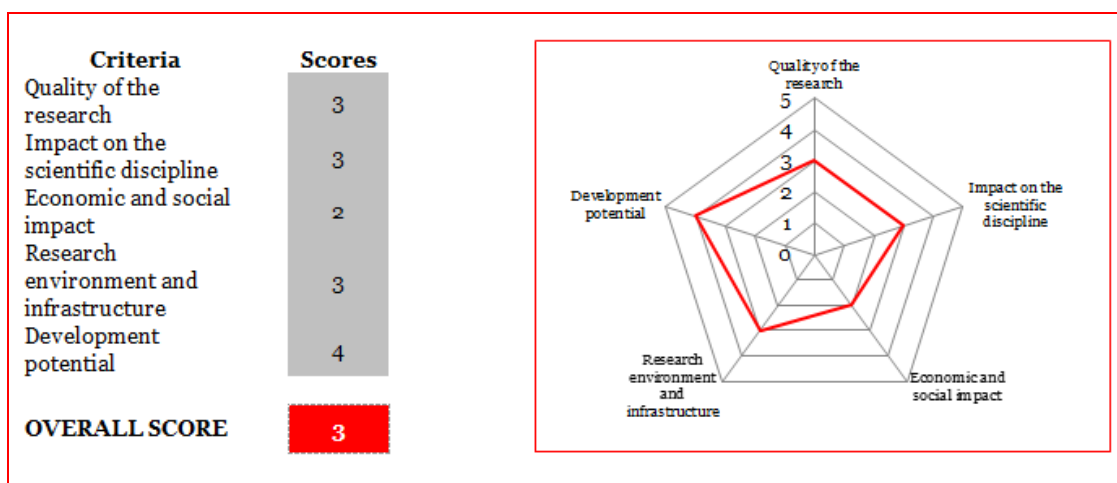
RSUDM is an important institution, which should be taken into account for all future developmental plans in the field of medical sciences. It provides a research-minded sustainable critical-mass environment, solid infrastructure, and sound developmental plans which deserve to be supported. The RSUDM has the capacity to improve its international collaboration by taking advantage of the experience and competence acquired by their high profile clinical research groups. Since a major portion of PhD students in medical sciences in Latvia are obtaining their degrees at the RSUDM, it is advised to incorporate higher standards for obtaining a PhD degree (requirements for 2-3 published papers in journals with medium-to-high impact factor and obligatory 6 months stay in a research institute abroad). Such new rules should help improving its international visibility and recognition.

11. L_11_Institute of Systematic Biology / Department of Anatomy and Physiology

Name of the institution	Institute of Systematic Biology + Department of Anatomy and Physiology
Name of university	Daugavpils University, Faculty of Natural Sciences and Mathematics
Type of institution	HEI

The description of this unit lists Institute of Systematic Biology and a Department of Anatomy and Physiology. Based on data analysis and site visit the Department of Anatomy does not seem performing any research. It is not research unit per se but university based educational department. Therefore, it was not considered in this evaluation and only the Institute of Systematic Biology is being evaluated. The Institute of Systematic Biology is part of the University and is operating in a normal European standards manner, i.e. research plus teaching. A very good example how research and teaching duties could be combined together. Although, it is relatively small Institute and is very well organised and focused on particular research field of systematic biology.

Figure 11 L_11 – Scores



Overall Score

Institute of Systematic Biology global performance is at good level. The institute is considered as Strong National Player with some International recognition. This is mainly due to very good quality of conducted research and publishing research outputs in very good, leading scientific journals. Institute is well organised and managed. The potential to develop is high. Over the next 10 years the institution can be able to strengthen its position in the international scientific community as a convincing actor and a trustworthy partner within international collaboration networks. Further plans should be focused on particular aspects of systematic biology with combination of other related disciplines. The research infrastructure in terms of facilities and equipment is in stage of development. It is well organised and planned. The weak point is low economic and social impact of the Institute’s activities. This is mainly due to its relatively small size, low number of students and narrow topic of investigations. The development strategy addresses these issues to some extent.

Quality of Research

The work of the Institute of Systematic Biology contains some very good quality research that is published in local journals but some research is also published in very good international peer-review journals and some in the highest ranked journals in this field. The scoring given reflects the quality of the research of the Institute of Systematic Biology, which is a strong national level institution with some international recognition. The effectiveness of the research staff could be considered as good with relatively high number of publications per researcher. The results published in high ranked scientific journals are limited in terms of narrow niche area. New modern approaches are applied in research conducted in the Institute.

Impact on the scientific discipline

The impact of the research by the institution on the development of the different scientific disciplines covered is limited as a whole but there are some notable contributions in specific areas of strength. This includes especially systematic biology and genetics and parasitology. A small number of citations of published work reflect the investigations conducted in the narrow focused aspects in a narrow niche. The position of the institution within the international scientific community as a whole still has to vie for its full status. However the Institute impact on the international scientific community specialised in the systematic biology is unquestionably.

Economic and social impact

The economic and social impact of the research is limited. The documentation lists collaboration with five local companies and some public research institutes but the contribution of these collaborations on economic and social developments is not evident. There are also some national conferences and courses organised but again the impact of such activities is limited on a national or international level. The DU ISB promoted business and firm development is also not well characterised. The relatively small DU ISB educational programme is rather ineffective in promoting science in modern society, although increase in students' number is promising.

Research environment and infrastructure

The research environment and infrastructure of the Institute of Systematic Biology are evolving and there is a relatively large number of PhD students with 32 enrolled in 2012 and 9 PhD completions in 2012. Although there is a distinct lack of research leadership with only 0.5 FTE of a professor, there is a very well structured and ambitious research strategy with clear main aims and specific tasks related to staff development, infrastructure improvements for achieving the stated aims. The management of research of the institution is very good however small structural adjustments are needed. The Institute of Systematic Biology is part of the University and is operating in a normal European standard manner, i.e. research plus teaching (300 hours). Collaborate with the Laboratory of Innovative Microscopy is an important aspect of conducted research. The Institute's laboratories are clean and organised in good places and quality. The DU Institute of Systematic Biology administers the valuable world's largest collection of beetles and electronic database of ground beetles an important contribution to the field of systematic biology. Also, the Field Research Station is an important infrastructure administrated by the Institute. After further development the research infrastructure of the institution would be fully suitable for conducting modern, technologically advanced studies on systematic biology.

Development potential

The institution is able to continue its development based on its research strategy and became a strong international player, but to establish itself at the international level the research must be focused on areas of strength only and develop stronger collaborations with international institutions in these areas. The Institute has to avoid to broad the research topics. The studies and expertise on systematic biology (the main topic of research conducted in the Institute) could be combined with environment

research/ecology/studies on biodiversity. It will broaden the research scope of the Institute giving an impact to further development. The long-term strategic planning of research development, the teaching and human resource development strategy includes increase of number of students and number of research personnel. The institution is still in the process of creating an internationally comparable research environment, however, the management, enthusiasm and the research development strategy are very promising.

Conclusions and recommendations

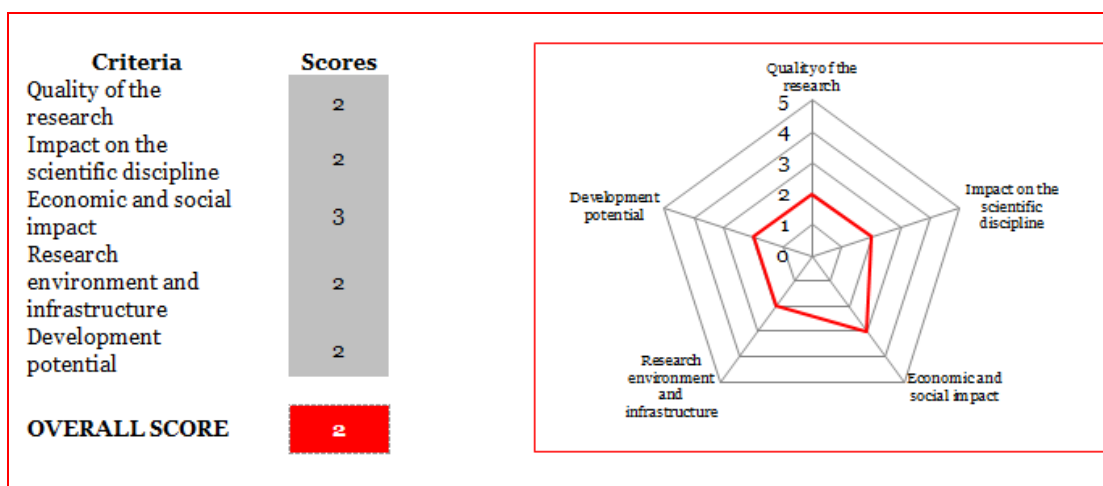
- The institute due to its size and expertise has to avoid spreading its activities to too many fields.
- The Institute has a real niche area and perhaps that will broaden when combined with ecology.
- The collaboration with the Laboratory of Innovative Microscopy, collection of beetles and electronic database of ground beetles database and the Field Research Station are important aspect of conducted research and should be developed.
- More international collaborations, research activities (conferences, workshops) are needed. The Institute should not limit its activity to national or Baltic research area but rather spread globally its international connections in the broad field of systematic biology combine with population genetics, biodiversity, environment protection and ecology.

12. L_12_ Institute of Biology

Name of the institution	Institute of Biology
Name of university	University of Latvia
Type of institution	HEI/SI

The Institute is responsible for students' education in the area of biology and for research within this field. Regarding research there are two strategic directions. First, work on Latvian natural resources and biodiversity including the influence of anthropogenic factors and second, research on the mechanisms of the plant and life cycle bio regulation and biological productivity.

Figure 12 L_12 – Scores



Overall Score

The Institute of Biology is a satisfactory national player with little international recognition. The scientific visibility of the 12 research groups is not equal. Best research topics are in genetics, biochemistry and experimental entomology. Taken into consideration the number of researchers the scientific output is weak and international visibility is small. The institute should increase its efforts to gain funding by, for example, the EU. The existing co-operations with Latvian research units should be extended and new ones started in particular with the Faculty of Biology. The research plans of the Institute for the future are rather vague and should be more specific.

Quality of Research

The Institute of Biology has interestingly two main specific research focus: one is on environmental biology mainly for Latvia and the Baltic Sea area, the second one is research on the influence of anthropogenic factors including pollution on the functioning of bio systems and the mechanism of plant and animals bio regulation. On the occasion of the site visit, the scientific output of the Institute could be further analysed and discussed and confirmed the evaluation made from the data previously provided by the Institute. There is no doubt about the Institute's scientific work on the Latvian natural resources, ecosystem biodiversity and population dynamics. In addition the research on mechanisms of plant and animal life cycle bio regulation, biological productivity and the influence of climate change on terrestrial and aquatic

ecosystems was highlighted. Beside more classical biological investigations with emphasis mainly on Latvia and the Baltic Sea area work in the area of genetics is performed. Within the assessment report 2006-2011 the participation in the International Long Term Ecological Research (ILTER) is mentioned. However, the section 2.4 'Copies of the Institution's/ Unit's best publications' where 20 publications are listed (2006-2010), no relevant output can be found with this respect. In conclusion, the Institute can be considered as a satisfactory national player with acceptable international resonance.

Impact on the scientific discipline

Regarding the publication output the international recognition is not very high since most of the work was published in journals with low impact factors. According to SCOPUS analysis the ISI output is 7 per researcher within 5 years and 12 as total output. The Institute participates in international ecological research and is with this respect the coordinator for Latvia. By the site visit the impression was gained that on the basis of the LTER network international recognition was achieved. However, this was not very well documented. A considerable number of international conferences, workshops and seminars were organised by the Institute or by its members and several young researchers from the Institute looked highly motivated. Researchers from the Institute gave a number of invited lectures on conferences outside Latvia, an important contribution to the impact of the Institute on its discipline outside Latvia. In conclusion, regarding the impact of the institute on the scientific discipline can be evaluated as being mainly a strong national player.

Economic and social impact

The Institute is engaged in co-operations with industry. Focus is on the optimisation of the use of fertilizers and liquid plant fertilizers that are produced by companies based on the Institute research and results. The Institute acts also as consultant for Latvian farmers, for example, for the control of agricultural pests. High quality peat substrates have been developed and products are now made by a Latvian company. Eighty percent of the products are exported. A cooperation with a forest nursery company resulted inter alia in the production of seedlings to be exported. From interview with doctoral students of the Institute (11 were present) it appears that some of them had already or will have stays outside Latvia (i.e. ETH-Zurich, Ohio and the Netherlands). Students gave a positive judgement on the intensity and quality of the supervision by the institute. Regarding stipends it was claimed that these are not sufficient and students had to finance themselves consumables for performing experiments. In summary, the economic and social impact of the Institute can be estimated as good.

Research environment and infrastructure

The Institute's building is very old, not well maintained (the elevator is out of service for years), is claimed to be renovated within the financial frame of a collaborative partnership within the ERDF framework. The Institute operates three research stations: The Engure ornithological Research station, the Pape bird migration study station and the Salaca hydrobiological monitoring station. The Institute houses also the National Herbarium of Latvia, an insect and tick collection and a collection of bio agents. A bird-ringing centre operates within the Institute with a database of over 30,000 records. The Latvian Institute of Aquatic Ecology and the Institute of Microbiology also use the Institute's facilities. Laboratory equipment and apparatus of ULIB are basic and needs to be renewed. Regarding a potential cooperation with the Faculty of Biology and the Institute of Systematic Biology at Daugavpils University nothing was reported. Merging with the Faculty of Biology looked mandatory to reach the necessary critical mass in both personnel and equipment. Regarding funding more than 75% is State budget funding with 42% core (maintenance) funding. The uncertainty of the Institute's budget makes its future uncertain. In summary, the Institute can be regarded as a satisfactory national player with a decreasing international visibility.

Development potential

In general the tendency of the institute is to increase the amount of fundamental research as compared to applied one. Such effort and vision should be encouraged and sustained. Focus in the area of Latvian terrestrial and aquatic ecosystems in the context of long-term environmental changes and the Impact on genetic and species biodiversity is an interesting vision and the potential results should be the basis for recommendations to the public and to the industry. However, the lack of success in getting external research funds leaves this to a non-progressing status. The Institute general policy and research plans are vague. In conclusion, it is recommended to bundle the research activities and reduce the number of topics/projects to obtain efficient groups each with an adequate number of researcher. The process on readjusting the age structure of the researchers should be continued. It is recommended to increase the international visibility and competitiveness of the Institute.

Conclusions and recommendations

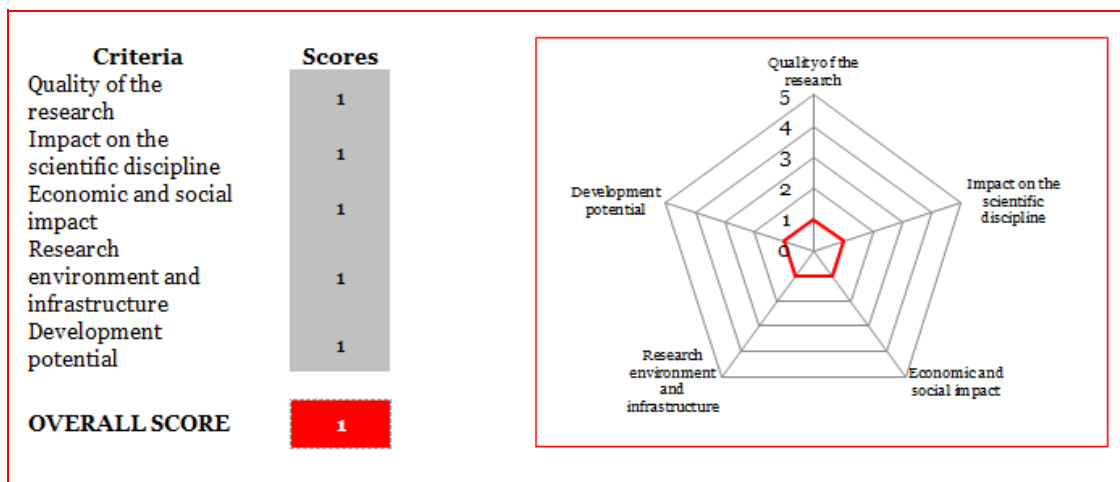
- The activity of the Institute is rather diverse. Beside more basic research in the area of genetics and biochemistry, there are groups inter alia in ornithology, hydrobiology and regarding ecological questions.
- The Institute due to its size and expertise has to avoid spreading its activities to too many fields
- The Institute should maintain and increased its activity on the two specific research topics they have developed with success which is on environmental biology mainly for Latvia and the Baltic Sea area and research on the influence of anthropogenic factors including pollution on the functioning of bio systems and the mechanism of plant and animals bio regulation.
- The output is in many cases rather descriptive without innovation. About 50 researchers are spread over 12 research groups, which does not allow reaching the critical mass needed for international competitiveness (i.e. ecological topics are just monitored without innovation). Although important work is performed in the field of new fertilizers and high quality peat substrates done in cooperation with industrial companies, it did not reached international visibility.
- Housing the National Herbarium of Latvia, which constitutes a Latvian priceless national heritage should benefit from a recurrent National grant covering salaries, maintenance and research

13. L_13_Centre of Psychoneurophysiological and Bioregulation Research

Name of the institution	Centre of Psychoneurophysiological and Bioregulation Research
Name of university	Centre of Psychoneurophysiological and Bioregulation Research
Type of institution	SI

The Centre for Psychoneurophysiological and Bioregulation Research (CPBR) is a small institution with a major interest in interdisciplinary study of psychomotor disturbances in children (primarily ADHD) using non-invasive neurophysiological methods (EEG, etc.) and their non-pharmacological treatments using biofeedback and similar techniques. The CPBR consists of 5 researchers (3 MDs and 2 PhDs in biology) who undertake their activities within rented facilities. The current status of the Centre within the Latvian system of research institutions is unclear since it has not received any funding since 2009.

Figure 13 L_13 – Scores



Overall Score

The profile of the CPBR is not that of an institution but rather of a small research group with a research interest in an area of a high societal impact. During the last 5 years it has attracted minimal funds for research support and has not published any papers in relevant scientific journals.

Quality of Research

Based on the published paper and other documents provided in the report, the institution has a very narrow and limited research performance, with a main focus on the introduction of international research trends in Latvia. The research performed by the institution contains new scientific discoveries only sporadically. The profile of the research by the institution is nationally limited and not involved in debates of the international scientific community.

Impact on the scientific discipline

From the documentation provided, and given the very narrow research activities, funding and human resources, the impact of the research is very limited and targeted mainly toward the national research community.

Economic and social impact

Although the topic of the research is rather narrow, it has very important societal consequences. Unfortunately, from the scarce documentation provided, the impact of the institution activities has not shown significant development.

Research environment and infrastructure

The CPBR occupies rented facilities, which is not a stabilising factor. The basic equipment installed allows performing only partially the research protocols used for their scientific objectives.

Development potential

From the documentation provided, it appears that the institution is far from being established as an internationally recognised research facility.

Conclusions and recommendations

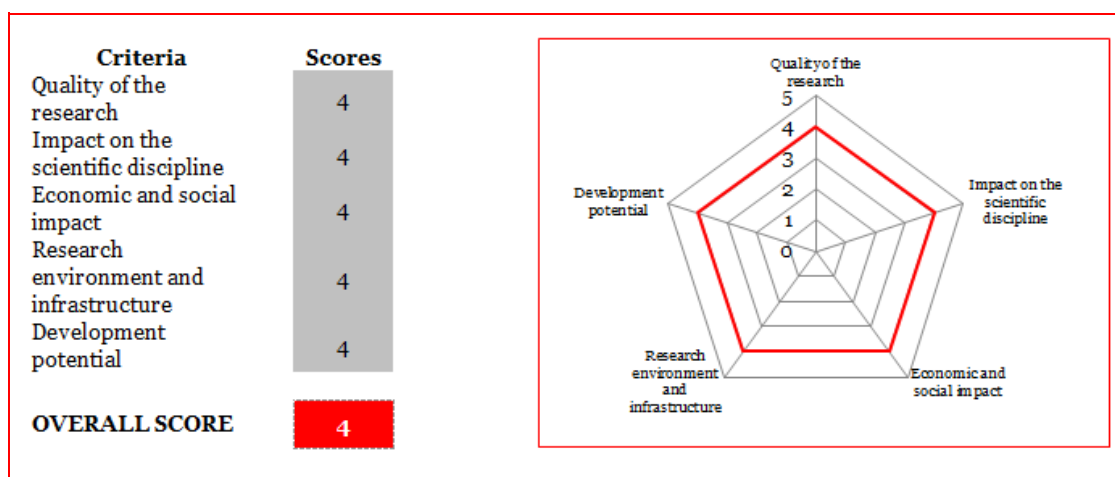
Given the potentially high societal impact of the CPBR research area, it could be considered for financial support only if it joins a larger medical institution, which should provide for a research-minded environment and higher probability for obtaining financial support for future development and translation of findings in the society.

14. L_14_Paul Stradins Clinical University Hospital

Name of the institution	Paul Stradins Clinical University Hospital
Name of university	Paul Stradins Clinical University Hospital
Type of institution	Scientific institute

Paul Stradins Clinical University Hospital (PSCUH) is the largest clinical medicine research institution in Latvia. It is multi-disciplinary with a large number of clinical specialities and it collaborates with all the leading medicine- and biology research centres in Latvia. The number of employees is around 3,000; of which 80-100 hold doctoral degrees. It is one of the main places in Latvia for medical scientists' trainings and internships. The hospital has a large number of doctoral students from the Riga Stradins University, and the University of Latvia that perform their research projects within the hospital. Many of these doctoral students are also part of PSCUH personnel. Several of PSCUH's most active and recognised scientists are also affiliated with these universities. It is an independent institution and it is identified as a scientific institute (SI).

Figure 14 L_14 – Scores



Overall Score

The overall score is based on the high number of clinical trials, a high quality research infrastructure, a well rationalised strategic plan for future research, as well as successful clinical research projects where an employee is a leader or one of the leaders, resulting in publications in high impact international journals.

Quality of Research

The information found within PSCUH's Self-Assessment report (SAR) reflects high scientific enthusiasm and scientific activity. The total number of scientific outputs is high and the average number of citations per publication is also good (> 10). Several of the papers are published in highly ranked journals within their respective field of medicine. Scientists within the field of heart and cardiovascular diseases with professor Erglis in the forefront are especially active with high impact contribution in multinational collaborations. More than 300 contracted research projects were performed within the PSCUH, whereof a large proportion was clinical trials. The number of patents is good. The hospital's funding for scientific activities was among

the highest compared to other similar institutions within the field of Life and Biomedical Science in Latvia.

Impact on the scientific discipline

The PSCUH is a very strong and important player within the clinical research field in Latvia. It has acted as a leading institution and coordinator in several national research programmes and has been in the leading position in consortia uniting scientific efforts of many of the most important institutions within the medical field of Latvia. It is a recognised centre of competence within the international scientific community, reflected in the participation of several multinational research projects. One of the main successes has been in creating research infrastructure to take on clinical studies, in particular clinical trials of phase II – IV. Because of this the institution has had a great impact on the development of the medical discipline in Latvia and created a strong ground for the Latvian scientists to make heavier impact at the international level.

Economic and social impact

The economic and social impact of PSCUH in Latvia is high. Clinical research at the hospital is important for society, having a direct impact on the health of the Latvian people. It is a highly esteemed partner in clinical research and trials both within and outside the academic environment. Its personnel had a contribution to a number of patents that evolved during the assessment period. Staff members are in high demand as experts in the public and private sector. It is a very important collaborative institution for several academic and non-academic institutions, both national and foreign, especially within the Baltic and the Nordic countries. The institution provides infrastructure for the research training of a large number of medical students from Latvian universities. During the assessment period about 130 started their post-graduate studies. The number of doctoral dissertations was a little more than 20, which is relatively low. All of the students who completed their PhDs during the assessment period are now employed at the hospital.

Research environment and infrastructure

In the assessment period ca. 13 million LVL were invested in new equipment and around 9 million in improvements of the research infrastructure, making the hospital a leading Latvian scientific institution to carry out clinical research. Positive reviews by European Medical Agency (EMA), by the US Food and drug administration (FDA) and by the very high number of clinical trials performed through the assessment period reflect the high quality of the hospital's infrastructure. The research is mainly localised in one area but in many relatively small and rather old buildings that in some cases are poorly maintained and not really streamlined to serve as an efficient modern clinical research hospital. It is to be noted that despite a very heavy routine clinical practice, more than 60% of the personnel with doctoral degrees had one or more scientific output in the assessment period which reflects a highly motivated research environment, based on a high quality infrastructure. The development of Phase I clinical trial facility is underway and should further strengthen the capacity for clinical trials of PSCUH and its establishment as an important international player in this field.

Development potential

The developmental potential of PSCUH seems to be high. It is a large hospital with a long history in clinical medicine. The research environment and infrastructure for clinical research is of a high standard within the hospital. It collaborates with all the major players within the medical field in Latvia. It seems that the hospital has performed the groundwork that should enable it to become a stronger international player in the future. It has a well-rationalised strategic plan for future research. Its selection of research themes sound promising, although international competition will be very strong within all the selected fields and it will be a challenge to find niches for successes. The future vision of its leaders, to become the leading centre of education

and science in Latvia and one of the leading medical research centres in Europe, are ambitious goals and worth pursuing.

Conclusions and recommendations

It seems that the main hindrance of assuming a scientific leadership in one or more scientific disciplines is enough funding and too much clinical workload of the employees and the doctoral students. The vision, the enthusiasm and the ambition are present as well as international connections of a high standard. The aim should be to increase the time that current employees can devote to research, create post-doctoral research positions and also increase the number of young research scientists that have a good international scientific background and connections to internationally recognised research institutes/hospitals. It is also of importance to increase the quality of the PhD research projects performed within the hospital. This needs to be done in collaboration with the Universities. One way to do this is to formalise the requirements for receiving a PhD degree which should include publication of two to three papers in international peer-reviewed journals with at least an average impact factor of which the PhD student is a first author on at least two of these papers, and a requirement that a part of the PhD is performed within a prominent international university hospital/research institution abroad.

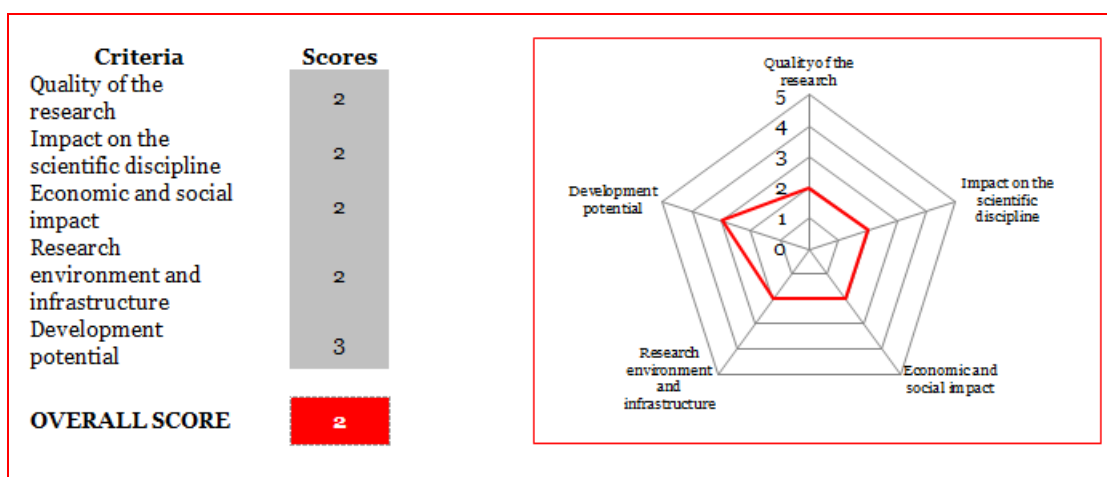
One way to increase funding availabilities is to change the status of the hospital since, as is pointed out in the SAR; “changing the public corporation status of the hospital would help to attract the European Structural Funds”.

15. L_15_Riga East University Hospital (+Infectiology Centre of Latvia)

Name of the institution	Riga East University Hospital (+Infectiology Centre of Latvia)
Name of university	Riga East University Hospital (+Infectiology Centre of Latvia)
Type of institution	Scientific Institute

Riga East University Hospital (REUH) is the largest hospital in Latvia and one of the major sites for medical training and internships. A relatively large number of their medical doctors are PhD students at the Riga Stradins University or at the University of Latvia and they perform clinical research projects within the hospital. REUH is an independent institution and it is identified as a scientific institute (SI).

Figure 15 L_15 – Scores



Overall Score

The scoring reflects the current situation of a relatively low scientific activity and research of a low international prestige, considering the size of the hospital.

Quality of Research

In 2011 the number of personnel with doctoral degrees was about 70 and the large majority (approximately three quarters) had not a single scientific publication in the period 2006-2011. However, there was an improvement in 2012. The number of employees with doctoral degrees increased and the proportion of personnel with publications had also increased a little. The number of clinical trials has been increasing throughout the period of assessment, reaching more than 50 in 2012. The average number of citations per publication is good (> 5), but not many of the publications are within highly ranked international journals. The scientific papers included in the SAR for review were five. REUH was affiliated in none of them, but in the SAR it was pointed out that in one paper (NEJM), one of 10 authors (nr. 6) was affiliated with REUH. In two of the papers all the authors were affiliated with the Infectiology Centre of Latvia (ICL). One of these papers had never been cited and the other had only 3 citations (publication year 2010 and 2011).

Impact on the scientific discipline

REUH is a very large hospital, covering most fields of clinical medicine. It is one of the major sites for internships and training of medical students and a number of students perform their PhD research projects within the hospital. It has a wide portfolio of collaborators and a number of clinical trials are performed at the hospital. It facilitates the development of research activities in Latvia in many ways, including participation in building up a large bio bank of a high quality. The hospital has a stable position in the national scientific community, and it could have potential to evolve within the international scientific community.

Economic and social impact

Training of medical students and clinical research at REUH is important for the Latvian society. Interaction with non-academics within Latvia is at a level that is expected of a recognised academic institution.

Research environment and infrastructure

REUH buildings are new and relative large and spacious. Most of the equipment is also new, up to date and equipped to use the latest technology, including a national reference laboratory in the field of microbiology and virology that is accredited according to international standards. Despite this favourable setting for high quality research environment, the research within the hospital does not reach the level that is expected in the international scientific community of such a large University hospital. The explanation given by the responsible authorities within the hospital is that there is no money for science due to poor funding availabilities for scientific projects and there is no time either, due to heavy clinical workload of the personnel. However, ambition exists within the hospital to increase scientific activity and the quality of research and the increase in numbers of scientific outputs observed in the year 2012 is a positive sign. Long term strategic planning is considered within the SAR report but financial research planning is considered difficult by the management, again due to outside factors. The orientation of the research work and the emphasis is satisfactory but it is unclear if it will increase the possibilities of successful original research projects. The number of doctoral students involved in clinical research is acceptable but should be increased. A large part of the PhD students are REUH employees and the large majority of newly graduated PhD students are also employees at REUH, being a weakness and strength at the same time.

Development potential

Through clinical work large amounts of high quality clinical data is consistently produced within REUH and high numbers of various specimens are taken for diagnostic purposes, including tissue samples collected and preserved in bio banks. The personnel include an acceptable number of medical doctors holding a PhD degree and also an acceptable number of PhD students. Yet, this has not been enough to create a research environment producing scientific results of a high quality. However, that does not mean that it could not reach that stage in the future. All the necessary ingredients already exist to create a high quality research environment, except for two of the most important things. One is sufficient funding. The hospital has received less funding than institutions of a comparable size and function in Latvia. The other and the most critical one is sufficient number of research-minded personnel necessary to create a critical research mass to ensure scientific success.

Conclusions and recommendations

The size of the hospital, the large amount of clinical data produced through daily clinical work, the large number of high quality up-to-date equipment and the relatively new and modern hospital buildings. All these factors are already present and are favourable for an effort of developing a high quality research environment for clinical research. Research opportunities exist within the hospital and one of the more unique opportunities is that the majority of all cancer patients in Latvia are diagnosed and treated at the hospital. The hospital realises that this could give it unique opportunities in clinical trials and research at an international level.

The main challenge of the hospital is to create more research-minded atmosphere within it. One of the most essential things is to reach critical research mass within the hospital. Increasing time that the employees can devote to research and to create a sufficient number of post-doctoral research positions is important. It is also essential for the hospital to find a way to increase the number of enthusiastic young research scientists that have a good international scientific background and connections to internationally recognised research institutes/hospitals. It is also of utmost importance to increase the quality of the PhD research projects performed within the hospital. This needs to be done in collaboration with the Universities. One way to do this is to increase the requirements for receiving a PhD degree. The requirements should be two to three publications within international peer-reviewed journals with at least an average impact factor. The PhD student should be a first author on at least two of these papers. It should also be a requirement that a part of the PhD is performed within a prominent international university hospital/research institution abroad.

One way of increasing the funding availabilities of REUH within the EU granting system is to change the legal status of the hospital. This has been one of the main emphases of REUH management for a relatively long time and needs to be considered as soon as possible.

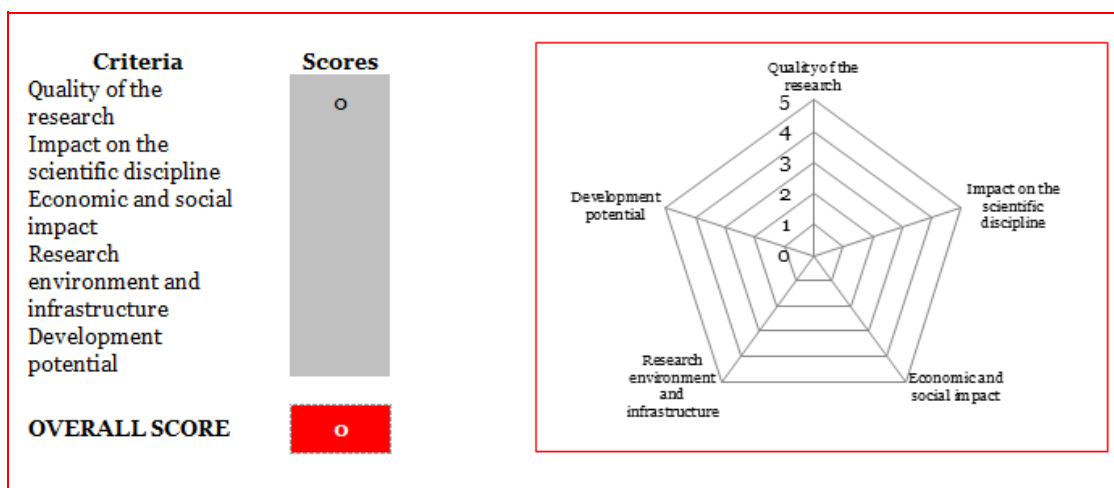
16. L_16_Contra Cancrum Coli

Name of the institution	Contra Cancrum Coli
Name of university	Contra Cancrum Coli
Type of institution	SI

Contra Cancrum Coli appears as Science institution from Latvia registered under the n° 464101 since 2007. Contra Cancrum Coli describes its research as: “results have the world novelty, provide the new step in large bowel surgery, gastroenterology, CRC screening. They are fixed in patents”.

The Contra Cancrum Coli has also a web page in Russian and English: http://www.coloncancer.lv/index_engl.htm

Figure 16 L_16 – Scores



Overall Score

Contra Cancrum Coli has no academics in his personal nor any students, no publications list, only patents. The evaluation panel has thus considered that Contra Cancrum Coli is not a research institute and therefore scored ZERO.

Quality of Research

Contra Cancrum Coli has no academics in his personal nor any students, no publications list, only patents. The evaluation panel has thus considered that Contra Cancrum Coli is not a research institute and therefore no assessment has been made.

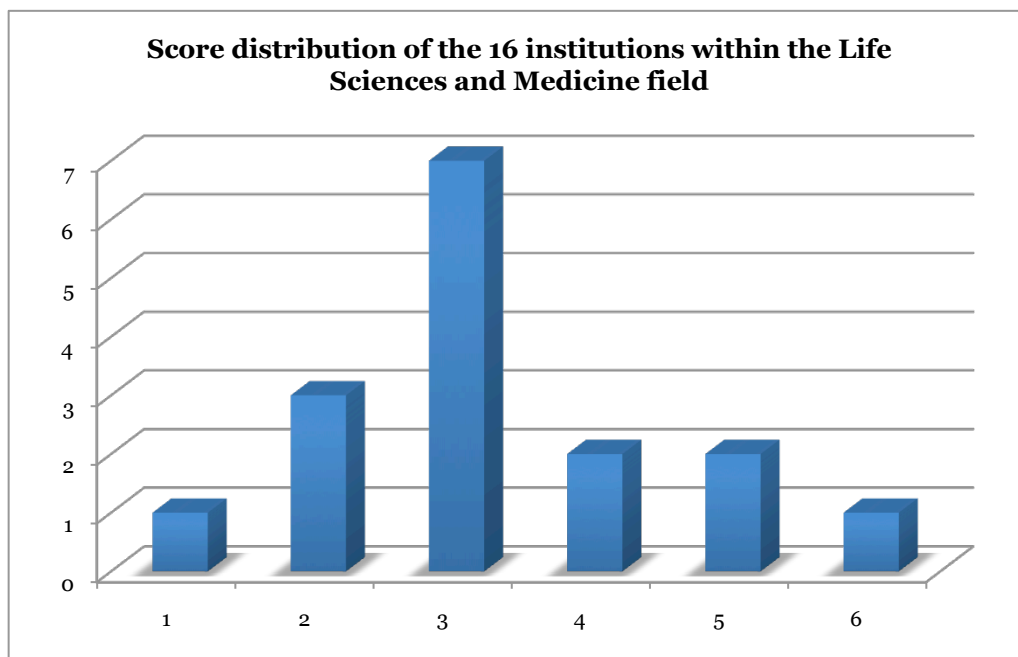
Comments

The panel evaluation looked with interest at the activity of Contra Cancrum Coli and gives credit to the patents made. Therefore, it recommends to negotiate with one of the academic hospitals and the Faculty of Medicine of the University of Latvia to be part of them and as such can become recognised promoter of project research, introduce project research at the national and EU level and enrolled PhD students.

17. Summary of the Institutional Assessments

17.1 The general level of quality of research in Latvia in the fields covered by Panel L

The table below illustrates the distribution in terms of general scoring the institutions evaluated.



The assessment exercise is intended to benchmark Latvian research in an international context and the table above reflects the considerable variation of the level and the quality of the research performed within the institutions evaluated. The majority of the institutions score rather low in an international context (2 and below), including all six institutions within the University of Latvia. Most of the institutions scoring low are of small size and/or with research infrastructure of a low quality. The three institutions with the highest scores have a few things in common; two of them (namely, the Latvian Institute of Organic synthesis and the Latvian Biomedical Research and Study Centre) are multidisciplinary state scientific institutions of medium size (on a European size scale). The third institution, Paul Stradins Clinical University Hospital is officially also a scientific institution, despite its name. It can be classified as small-sized, if we consider its number of FTE employees, or medium-sized if we take into account the number of employees holding a PhD degree. The research infrastructure within the hospital is of high quality resulting in a motivating research environment for the employees with a successful outcome despite low FTE number.

The general low score illustrates that some fundamental governmental changes within its research policy should be urgently launched.

17.2 Key strength(s), areas of particular interest

- The major strength of research in Latvia is the potential of young researchers, which should be much better exploited. This is a real strength within Europe and this advantage should cleverly be invested in.

- The IOS has the right “Zeitgeist” to indeed be competitive at the international level and has been able to adapt its research vision and policy in terms of infrastructure, performance, new equipment acquisition, success in grant applications and management. IOS has also established a Scientific Advisory Board. It is the example to follow. The IOS should teach the other institutions their research policy, grant application success and managerial skills particularly to the other two best institutions. For instance, the Biomedical Research and Study Centre should adapt their infrastructure and building management to keep their leading position.
- The activity within the clinical and medical research is rather high in Latvia and although in general most of the institutions are too small and score rather low on international level, this research field has potential to grow and reach higher international standard. Within this field Paul Stradins Clinical University Hospital can be considered as a potential pocket of excellence. It is already well on its way being internationally competitive and could become the driving force for the medicine field in Latvia to develop further in international competitiveness. The research infrastructure for clinical research is of a high standard within the hospital and the research output reflects highly motivated research environment. The main hindrance for further development is the hospital’s low FTE figure, low number of PhD students and the lack of postdoctoral positions. It should also be pointed out that although the present level of research within Riga East University Hospital is of rather low quality and the large majority of its employees with doctoral degree seem to lack scientific enthusiasm, a number of the other factors necessary for further development are on hand. The fact that 85% of Latvians diagnosed with cancer are diagnosed at the Riga East and collaboration with the Biomedical Research and Study Centre provide strong foundations for larger number of high quality clinical trials and opportunities for large original research projects that could score high on international level. .

17.3 Main weaknesses, areas of particular concern

- Maintaining sixteen research institutions in Latvia at the level of the competitive European environment appears on a first analysis as attempting the impossible. The challenge is therefore to find innovative ways to improve the current status. Besides renovating infrastructures, new approaches have to be considered.
- In general terms the governmental funding for research within Life Science and Medicine is too low and this is one of the major weaknesses. If it is expected that institutions within the field perform at a higher international level, financing needs to be increased. In particular funding of maintenance is too low as well as financing of building up research infrastructure of higher quality. The granting system also needs substantial financing input and synchronization as well. The current system does not allow the best use of available research money in Latvia. Too many grants to buy high tech equipments are not associated strongly enough with financed research projects secured for longer periods of time. Another major weakness is the lack of large grants awarded for longer periods of time. Lack of long term financing is a hindrance for long term planning and the creation of sustainable vision for future research within too many institutions in Latvia.
- Amongst other weaknesses, it can be noted that there is a:
 - Lack of infrastructure renovation and maintenance
 - Resistance to adapt to the competitive spirit to publish in highly ranked journals with the consequence of non-international recognition and failure in obtaining European and International Research grants.

- Lack of EU-applications: Caused by the only average quality of the research of some institutes, resulting in the ability of these to be competitive in applying for EU-grants.
- The lack of leadership and vision for launching clinical research studies, although it is important to reflect that there is some inclusion in international clinical research as participants.
- The lack of governmental funding (or extremely bureaucratic procedures) for patenting is a strong weakness.
- Most of the research is published in local journals, which confirms the isolation of Latvian research, a major factor for research.

17.4 The potential for consolidation of research institutions in order to reach critical mass in particular research fields

Although merging of institutions appears to be needed with an approximate 50% reduction (from 16 to 8), such recommendations is at risk and should be carefully prepared. The risk being that, *in fine*, the goal to improve the research quality and innovation will not be reached through the merging. Once the political decision is taken, the partners of the fusion (mainly the researchers and the administrative personnel) should participate in the discussion deciding how this fusion will occur. A consensus about the management of the future institution should be established. This is easily said but can be just impossible to reach. In addition merging has a cost and appropriate and specific means should accompany the process. For instance, in France, the merging of Universities was greatly impaired by the lack of extra money for accomplishing such a task (i.e. harmonisation of the different software used by the different administration of each institution, renovation of labs, moving of materials, recalibration of materials, etc.). An alternative to merging could be to increase the mobility of young researchers who should accomplish 50% of their research in another other institution but with a common project monitored by promoters from both institutions. This should improve the interactions between the institutions concerned, improve the intellectual environment, decrease the isolation, avoid the always-painful hierarchical reorganization and be less expensive. In that vein, the Irish example could be an alternative³. Indeed Ireland is a small country comparable to Latvia and their decision to create the Irish Universities Alliance, facilitating integration of research and facilities within clusters of 3 to 4 smaller universities was a success.

17.5 General Comments on the Latvian Research System

Latvian science is in a deplorable state. Latvian science funding in 2013 is less than half of what it was in 2008. It is now only 0.065% of GDP compare to 3,3% for Sweden and 3.1% for Finland. Latvian scientific institutions survived these 4 last years only because of support from EU funds (European Social Funds).

However, in light of the previous and present efforts (including this assessment exercise) conducted by the Latvian authorities it seems that there exists a real interest within the system to increase the level and quality of research within Latvia.

The general level of quality of research in Latvia in the fields covered by Panel L

As analysed in this assessment exercise (see 1.30), the majority of the institutions score rather low in an international context (2 and below), including all six institutions within the University of Latvia. Most of the institutions which score relatively low, all have in a small size and/or with research infrastructure of a low quality. The three

³ Irish University Association: Higher Education System Configuration-Position paper for the Higher Education Authority (see <http://www.iaa.ie/wp-content/uploads/2013/01/IUA-HE-System-Configuration-Jan-2013.pdf>)

institutions with the highest scores have the following common characteristics: two (Latvian Institute of Organic synthesis and Latvian Biomedical Research and Study Centre) are multidisciplinary state scientific institutions of medium size (considering European size scale) and the third institution, Paul Stradins Clinical University Hospital is conducting, with a high quality infrastructure, a high quality research with successful outcome despite low FTE number.

Most if not all institutions are concerned about future finance and grant opportunities. They express a high level of insecurity and uncertainty and it is evident that the situation drains out energy that would otherwise have been used to reinforce science and create an innovative atmosphere. Several expressed their dissatisfaction with the Latvian Research System and its lack of means to sufficiently support research within the field of Life Science and Medicine in Latvia. It was also noted that grants are usually for a shorter period of time and of low amounts making it impossible to build up large groups working on projects for longer periods, which is essential for international competitiveness. Also noted is the discrepancy in grants awarded for new equipments without sufficient funding of larger research projects for longer periods of time and secured financing of qualified personnel for longer periods.

Administrative scientific structure

On the contrary to Estonia⁴, Latvia did not reform its structure and unfortunately kept the Soviet Union parallel structure of research institutions, which was harmful. Although in 1992, the Latvian Council of Science⁵ intended to follow the advice of the Danish Research Council to integrate research institutions and the higher education institutions, this was not implemented. This dichotomy maintained for more than 20 years has impaired the main aim of a University, which is to conduct both teaching and research. The situation has somewhat improved as today a large fraction of scientists are affiliated both with a University Department and an Institute but is still far from being fully structured. As stated above (see 1.33), merging, which appeared in first analysis the solution, has to be well managed with appropriate accompanying measures.

Structure of the personnel

The maintenance of this unhealthy dichotomised system is also reflected in the division of the scientific personnel in two main categories: Academic personnel and research personnel. The academic personnel (Professors, Associated Professors, Docents, Lecturers, Assistants) are responsible for teaching. Recently graduated PhDs could of course be hired as researchers, but such positions appear to be permanent. The system of typically three-year post doc positions has been successful in many countries, but does not exist in Latvia. This is a severe drawback as post docs are the pillars of every laboratory. It is absolutely necessary for Latvia to implement a nationwide programme granting post doc positions on a competitive basis.

Another severe problem is the age-structure of the personnel. At most institutions the age-distribution is bimodal and heavily skewed towards scientists well above the normal retirement age in most European countries with a lower peak in the age range 30 - 40 years. The older scientists are presumably comparably well paid and form a bottleneck hindering the much-needed recruitment of young brilliant scientists. Small funding opportunities for young researchers and absence of funding for post-doc positions can lead to a generation vacancy in science; the threat is increased even more because of demographic decline and high emigration.

The doctoral students form a very important personnel category of every scientific institution. Despite the present difficult situation most PhD students that were interviewed during the site-visits were enthusiastic about their work. However, they

⁴ Article from April 2013 see <http://ukrainianweek.com/World/78685>

⁵ http://www.lzp.gov.lv/index.php?option=com_content&task=view&id=148&Itemid=112

pointed out the enormous differences in salaries for PhD students. The Panel noticed the lack of any standardisation or national recommendations/guidelines for the training of PhD students means that PhD students and young researchers have very variable experiences based on the quality of the local research environment and the initiatives of their supervisors. In a small country where most of the institutions are concentrated around or in the same city a joint or national support and development programme for young researchers would be very useful. Finally the management of Faculties, Departments and Institutes is important for the success of a scientific institution. The Panel noted that at some institutions the directors stayed at their posts for a very long time (perhaps they were permanently employed as directors). It is much better if Deans, Heads of Departments and Directors of Institutes are appointed for a fixed, possibly renewable, period of a few years. The Panel noted that the best institutions had young, dynamic directors that actively worked on renewing and raising funds for their laboratories.

Infrastructure

Although the best laboratories had adequate infrastructure, many institutions still had to manage with old equipment from the Soviet times. A particularly serious deficiency is that many institutions do not have access to important bibliographic and bibliometric databases such as Thomson Reuters Web of Knowledge and Science Direct. Classical libraries are often not up-to-date and the scientists do not have full online access to journal articles. This makes it next to impossible for the researchers to follow the developments in their fields. Also, with only a restricted access to international journals, young scientists may have difficulties learning how to publish in high impact journals.

Publishing practice

There are a few scientists who publish in highly regarded international journals. But still too much is published in conference proceedings, Latvian journals and other obscure publications. Papers in conference proceedings are typically not peer reviewed and they are at best read by some of the participants of the conference. With the advent of the Internet, conference proceedings have become obsolete. Even if some journals edited and published in Latvia, have an international profile and are indexed in the main international bibliographic databases, they still have a low impact. There does not seem to have been an enticement for Latvian scientists to publish internationally.

Internationality

Latvia is still to a large extent scientifically isolated. Many of the institutions evaluated by the Panel had no international collaboration in the form of foreign scientists visiting the institution or staff spending time abroad for collaborative research. Of course, the best institutions had normal international relations attracting foreign scientists to Latvia. It is of utmost importance for the development of Latvian research to increase international collaboration.

The best thing would be to start with the young generation and the PhD students. Most of them speak excellent English and are very eager to spend time abroad during their thesis work. It would considerably enhance their PhD education and, as a consequence, improve the future quality of science in Latvia, if it were made possible for every PhD student to spend, say, a semester at a university abroad. At the best Latvian institutions this has already been implemented and even made mandatory.

There is also a lack of funding for shorter research visits abroad for senior scientists.

Evaluation and peer review

New university professors are typically recruited internally without proper independent peer review. Funding decisions concerning research grants by the Latvian Research Council have until very recently been made without proper evaluation and peer review. This has led to scientific inbreeding, which has harmed

the development of science in Latvia. Latvia is a small country, where all key actors know each other. It is therefore imperative that all important science policy decisions such as recruitment and promotion of professors, funding of research proposals, etc. are based on independent international review. It is also important to increase competition, as this is the only way to increase quality. Research grants should be competitive and professors should be recruited after an open call.

17.6 Conclusions

From the international point of view, the level of research in the Life Sciences and Medicine in Latvia is low. All of the indicators used to measure this are low which was confirmed through this evaluation. Besides the aged infrastructure and the general lack of vision, the Panel noticed through their interviews with PhD students that the potential of young researchers is a gold mine for Latvia (if correctly managed). The Panel noticed the lack of any standardisation or national recommendations/guidelines for the training of PhD students meaning that the PhD students and young researchers have very variable experiences based on the quality of the local research environment and the initiatives of their supervisors. In a small country where most of the institutions are concentrated in or around the same city, a joint or national support and development programme for young researchers would be very useful.

17.7 Recommendations

A profound reform in the Latvian policy for research is needed if Latvia still wants to play an international role.

1. State funding needs to be increased substantially with improved distribution, taking into account specific areas in which Latvian research is emerging or areas that the government would like to develop.
2. Reforming the grant system to include a higher number of larger grants and awarded for longer periods is necessary to enable scientists to plan further ahead and build up larger groups to create and conduct original scientific projects of higher ambition and with greater international impact.
3. Substantial increases in funding for maintenance and the building up of research infrastructure of higher quality is also needed. A serious effort should be made to link the funding of the latter with larger scientific project grants for longer periods. In the past it has happened that new and expensive equipments have not been used effectively or are not in use due to lack of funding for research material or qualified personnel, or both.
4. The educational role within the university departments is very heavy and the research environment is of low quality and in some places a severe lack of research-mindedness was observed. Too few of the PhD students that perform their research in Latvia do it within the premises of the universities, due mainly to lack of space and equipment and in general, because of the low quality research environment.
5. Larger efforts are therefore needed to increase motivation for research by the personnel within the university, which should result in larger numbers of PhD students performing their research at the laboratories within the walls of the Universities. One way to do so is to create new positions to be occupied by young researchers with strong international research backgrounds as well as creating new post-doctoral positions also to be occupied by young researchers with strong educational and research experience at internationally respected institutions abroad.
6. It is also of vital importance to increase the international level and quality of the PhD programs, especially within the medicine field. One way to do this is to formalise the requirements for receiving a PhD degree. This would include the publication of two to three papers in international peer-reviewed journals with at

least an average impact factor, of which, the PhD student is a first author on at least two of these papers. In addition it should also be a requirement that part of the PhD is performed within a prominent international university hospital/research institution abroad.

7. The creation of Post-graduate Masters programme taught in English would attract international students from different continents (Asia, middle east etc) to come to Latvia. This will facilitate the release of the isolation in which Latvian universities are; in addition international students will pay an international fee. Such creation would foster an international recognition for Latvian universities. An example would be to create multidisciplinary Masters Programmes in economy/basic research for instance, this is very important at present in the growing pharmaceutical industry. Then, when programmes have been set up, Latvia could sell them internationally. The platform for developing this would be to undertake a process of merging/clustering Latvian Universities in order to offer a diversity of teaching and research that currently cannot be offered due to the scattered organization of the Latvian university/research environment.
8. Latvia should follow the example made by two emerging countries, one being Brazil (see http://www.access4.eu/media/2011_science_without_borders.pdf) which changed their policy and decided that 20% of the whole number of PhDs students of their country should perform their PhD in another country with the joint supervision of a thesis. The choice of the country and host laboratory is important and should be of a medium to high international standard, e.g., the Nencki Institute in Poland, the Debrecen University in Hungary, the Uppsala University in Sweden, the Kuopio University and Helsinki University in Finland. This cross-fertilisation will indeed help the opening of Latvia and will also fight its isolation. This governmental decision needs to be accompanied by means such as sufficient grants for PhDs students going abroad for a 4 year period with several back and forth visits to their Latvian promoter laboratory fostering internalisation, the progression in the cotutelle requirement for PhD diploma delivery. Immediate requirements for excellence such as first author in 2 international publications should be avoided and a 10-year programme for improving thesis quality/requirement should be created.

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