5th World Congress of Latvian Scientists "Research Latvia"

White paper: Policy recommendations

Preamble

The 5th World Congress of Latvian Scientists, *titled* ***"Research Latvia,"*** *took place in Riga from June 27th to June 29th, 2023. The event, inaugurated by Latvia's President, Egils Levits, successfully gathered more than 1300 on-site and online participants. The Congress proved to be a compelling platform for interdisciplinary and cross-sectoral debates.*

Aligned with the Science, Technology Development, and Innovation Guidelines 2021-2027, the ***national R&D system in Latvia aims to foster the growth of an intelligent, technologically advanced, and innovative society****. This overarching goal resonates with the three core themes explored during the 5th World Congress of Latvian Scientists: Digital Transformation, Green Transition, and Science Impact. Throughout Congress, it became evident that our future hinges on creating a knowledge society where evidence-based decision-making and collaborative innovations drive our quest for safe, efficient, and sustainable living.*

To enhance Latvia's standing in the global scientific market, a crucial aspect lies in promoting excellence while exploring new sub-disciplines and niche research with viable opportunities. Moreover, local ***promotion of research excellence must be more robust and visible.*** *While the Fundamental and Applied research grant competitions target outstanding scientific projects, limited funding often restricts support to only a few high-quality projects. Latvian scientists advocate for establishing a program that funds scientific excellence, aligning with the esteemed European Research Council grant requirements and evaluation criteria. This approach will cultivate a pool of research-oriented and competitive scientists capable of participating in prestigious international research programs.*

The active involvement of multiple stakeholders, including the scientific community, media, policymakers, and NGOs, is imperative for further advancing science in Latvia. ***We urge all sides to play their part and demonstrate commitment to effectuating vital policy changes that support breakthrough research and innovation.***

Priority I: Green Transition

The Green Transition provides ample opportunities for long term growth yet requires immediate and decisive action now. Its two intertwined trajectories of safe energy and smart bioeconomy share a common emphasis on advanced exploration of various natural resources. While these trajectories do not have clear divisions, they are closely connected with the changes we are currently experiencing, addressing pressing global challenges such as the climate crisis, safety and security, resource depletion, and supply chain disruptions. Climate change is the most significant medium and long-term factor that perturbs current practices across all sectors of Latvia's economy.

Key Considerations:

- The perception of society towards climate change plays a crucial role in determining the Green Transition's success. It is strongly correlated with trust in the government.
- Latvian scientists possess excellent preconditions for continuing transdisciplinary research on energy transition. Those include the modelling of technologies, societal and institutional development dynamics, and consideration of economic and environmental factors. On the technology front, there are promising prospects for the further development of bio-based heat insulation materials, CO2 utilisation, and aluminium recycling technologies.

- Biotechnologies are seen as the future of the green economy, ensuring sustainable development. The prospects of successful bioeconomy development in Latvia are bolstered by a solid human capital profile and a broad spectrum of available bioresources. We are fortunate to have a new generation of scientists with an open-minded approach to tackling the challenges in this field of the national economy.
- Recent advancements in nuclear synthesis/fusion hold promise as an avenue towards safe energy. However, very careful consideration must be given, aligning it closely with the aims and requirements of the EU Green Deal.

Key Actions:

- Research on energy transition must adopt **a transdisciplinary approach**, considering social, environmental, institutional, and political factors alongside technologies.
- Efficient mitigation of food security and disease prevention risks requires implementing the **One Health** approach, which focuses on the health of the soil, plants, livestock, and humans as a whole.
- **Nanotechnologies and biocomposite materials** hold significant promise as a foundation for creating potential "unicorns" (billion-dollar start-ups) in Latvia.
- Exploring **circular economy, waste recycling, and producing new materials using microorganisms** offers an outstanding opportunity to expand the range of available resources and achieve breakthrough innovations.
- Latvia possesses all the necessary conditions to establish energy systems solely based on renewable sources, achieved through integrating technologies and resources into **"smart energy systems."** These systems combine renewables-based power supply (e.g., wind power plants and solar photovoltaics) with flexible demand, such as electric transport, district heating, hydrogen production, synthetic fuels, and energy storage. In this vein, adopting an **"energy communities approach"** could be a

central solution for achieving Latvian energy independence and grid resilience.

- The installation of **solar photovoltaic (PV) panels** follows an exponential trend. It is crucial to continue research and development in these technologies and prepare a highly qualified workforce to support the expected strong growth in the solar industry. Moreover, Latvian industrial involvement in the supply chains of solar PV panels is equally essential.
- Research on green agriculture and forestry demands considerable time investment due to the well-buffered nature of soil and biomass ecosystems. It is imperative to conduct **long-term trials with stable financing in agricultural and forest research** to understand the full impact of human actions, which may manifest over several decades.

Priority II: Digital Transformation

Digitalisation has paved the way for rapid transformations in human society. While much of this progress has been technology-driven, discoveries and opportunities continue to captivate researchers and the general public alike. In this regard, blockchain solutions, humanoids, and large language models are amongst the currently emerging trends. A human-centred view of digitalisation is gaining momentum, seeking to balance technological and economic advancement with resolving social problems in an integrated cyber and physical space.

Key Considerations:

- Digital technology has become a prevalent means of interaction between the state and its citizens, necessitating support mechanisms to maintain a truly inclusive society. Digital democracy provides an opportunity to engage citizens in critical societal matters. Hence, improving the quality of digital media is crucial to mitigate the spread of fake news and disinformation.
- Although artificial intelligence is currently amongst the most visible technologies, digital transformation is enabled by a much broader set of ever-evolving technologies. Holistic analysis and design methods should be applied to achieve meaningful

digitalisation that serves the need of individuals, organisations, and the society as a whole.

- Many digital technologies require advanced skills. Therefore the development of digital skills should be promoted among researchers and the general public to benefit from digitalisation fully. Considering social, linguistic, cultural, and other contextual factors, personalised digital assistants is a promising technology that could be utilised for this purpose.

Key Actions:

- State-funded research programs should promote the usage of **advanced digital technologies in most areas of scientific research**, recognising the strong synergy between digitalisation and green transition, as well as other fields.
- While Latvia stands as one of the global leaders in developing digital infrastructure like the 5G network and optical communications, the success of digital transformation hinges on **more efficient involvement of social and human sciences** in understanding and managing change.
- A **proactive AI usage policy** must be adopted in Latvian research and higher education institutions while EU and national regulations are being prepared.
- Collaboration between areas of governance should be fostered and appropriate regulations enacted **to ensure that copyright and data availability do not hinder scientific development and innovation.** A considerable volume of already digitalised cultural heritage, including books and other printed materials in the Latvian language, remains inaccessible to researchers as valuable data for training large language models and conducting data-driven studies.
- Numerous digitisation initiatives, such as digital democracy, digital archives, language libraries, and annotation of cultural artefacts, require public involvement, which should be facilitated by **national crowdsourcing projects**. Such projects would also serve a significant educational role.

Priority III: Science Impact

The potential outcomes and impacts of investments in science are diverse, from contributions to knowledge advancement to the development of innovation and related economic outcomes, to broader societal impacts. The ability to understand, support, and communicate these outcomes and impacts is currently limited by overly narrow measures and data. Improved understanding and related measurement of the range of scientific impacts can inform policy planning, funding models, human resources, research environments and methodologies, and public understanding and support of science. Improving the way the scientific impact is measured and communicated will shape the public opinion, policymaking, and overall well-being of the nation.

Key Considerations:

- Despite relatively high prestige and ongoing investments, the performance of higher education institutions in Latvia falls short, with many students not completing their studies or being unable to explore suitable career opportunities.
- The ecosystem of Latvian science still carries remnants of the past that hold the system able and willing to change hostage.
- Latvian scientists, and their institutions, notably benefit from short-term scientific mobility, enabling brain circulation in the Latvian scientific community.
- Long maternity leaves and other forms of increasing support for gender equality measures form an essential capability of the Latvian scientific environment fostering women's careers in the field. However, the dominant project-centered model of financing significantly lessens the social security of the scientific community, thus also the appeal of a scientific career in Latvian research institutions.
- Engaging children and parents is crucial in science communication to cultivate interest in future career paths related to research and development.

Key Actions:

- Identifying and supporting the most promising scientific inquiry and application directions should be accompanied by **increased base funding and excellence-based assessment**.
- Science policy and communication should prioritise Latvian science's current and potential **competitive advantages**.
- While interconnected, **distinct financing flows** for scientific research and higher education can contribute to the sustainability of research environments and enhance the return on state investments.
- Bridging the gap between graduate studies and scientific practice requires a **sustainable science ecosystem** involving financial initiatives, legal preconditions, and solid mentoring practices from professors, researchers, and experienced co-workers.
- Developing **soft skills** for effective science communication should be integral to scientific training throughout researchers' careers. Science communication is about connecting with the audience and speaking their language rather than simply conveying information. Science communication should not, however, be only the responsibility of the scientific community. Institutions would benefit from outreach offices, modelled on international institutions.
- Exploring the potential benefits of **Industrial Doctorate** programs can lead to high-impact breakthroughs in research and development through a more integrated relationship between science and industry.
- Embracing a **broader notion of scientific impact** beyond bibliographic measurements requires fostering cultural, institutional, and administrative changes.
- Encouraging all excellent researchers to engage in teaching, supervision, or mentoring and involving all good lecturers in research activities can strengthen **the link between research and education**.

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