European Commission

Specific Support to Georgia

Improving the Effectiveness of Georgia's Research and Innovation System through Prioritisation, Selectivity of Funding and Science-Business Links

Horizon 2020 Policy Support Facility

Research and Innovation

Improving the Effectiveness of Georgia's Research and Innovation System in Georgia through Prioritisation, Selectivity of Funding and Science-Business Links

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Unit Analysis and monitoring of national research and innovation policies

Contact (H2020 Specific Support for Georgia:
Diana Senczyszyn, Coordinator of the Specific Support to Georgia, Unit A4 – diana.senczyszyn@ec.europa.eu

Contact (H2020 PSF coordination team):

Román ARJONA, Chief Economist and Head of Unit A4 - Roman.ARJONA-GRACIA@ec.europa.eu
Stéphane VANKALCK, PSF Head of Sector, Unit A4 - Stéphane.VANKALCK@ec.europa.eu
Diana SENCZYSZYN, PSF Team Leader, Unit A4 - Diana.SENCZYSZYN@ec.europa.eu

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Specific Support to Georgia

Prepared by the independent experts:

Krzysztof Gulda (Co-Chair, Poland)

Michael Schlicht (Co-Chair, Germany)

Manfred Spiesberger (Rapporteur, Austria)

Maria Nedeva (United Kingdom)

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Table of Contents

List of Tables

List of Figures

LIST OF ABBREVIATIONS

BERD	*Business Expenditure on Research and Development*
CC	*Competence centre*
CEE	*Central and Eastern Europe*
CIC	*Community Innovation Centres*
CRDF	*Civilian Research and Development Foundation*
DCFTA	*Deep and Comprehensive Free Trade Area*
DG	*Directorate-General*
EC	*European Commission*
EDA	*Enterprise Development Agency (Enterprise Georgia)*
EDP	*Entrepreneurial Discovery Process*
EIF	*European Investment Fund*
ERDF	*European Regional Development Fund*
ESIF	*European Structural and Investment Funds*
EU	*European Union*
FDI	*Foreign Direct Investment*
FSU	*Former Soviet Union*
GDP	*Gross Domestic Product*
GENIE	*Georgia National Innovation Ecosystem Project*
GEL	*Georgian lari*
GERD	*Gross Expenditure on Research and Development*
GITA	*Georgian Innovation and Technology Agency*
GNAS	*Georgian National Academy of Sciences*
G4G	*Governing for Growth USAID*
HEI	*Higher education institution*

H2020	*EU Horizon 2020 Programme for Research and Innovation*
ICT	*Information and communication technologies*
IP	*Intellectual property*
IPR	*Intellectual property rights*
JRC	*Joint Research Centre*
KNOW	*Krajowe Naukowe Ośrodki Wiodące (Leading National Research Centre)*
KPI	*Key performance indicators*
LEPL	*Legal Entities under Public Law*
MES	*Ministry of Education and Science*
MLE	*Mutual Learning Exercise*
MCS	*Ministry of Culture and Sports*
MEPA	*Ministry of Environmental Protection and Agriculture*
MOD	*Ministry of Defence*
MOESD	*Ministry of Economy and Sustainable Development*
MOF	*Ministry of Finance*
MOH	*Ministry of Labour, Health and Social Affairs*
MRDI	*Ministry of Regional Development and Infrastructure*
NGO	*Non-governmental organisation*
NPF	*National Foresight Programme "Poland 2020"*
NRIS	*National Research and Innovation System*
OECD	*Organisation for Economic Co-operation and Development*
PMPR	*Policy Mix Peer Review*
PLN	*Polish zloty*
PRFS	*Performance-based research funding system*
PSF	*EU Horizon 2020 Policy Support Facility*

R&D	*Research and development*
RI	*Research institute*
RIC	*Research and Innovation Council*
RIS3	*Research and Innovation Strategies for Smart Specialisation*
RTO	*Research and technology organisation*
R&I	*Research and innovation*
Sakpatenti	*National Intellectual Property Center of Georgia*
SBL	*Science business links*
SME	*Small and medium-sized enterprise*
SRNSFG	*Shota Rustaveli National Science Foundation of Georgia*
STI	*Science, technology and innovation*
STIS	*Science, technology and innovation system*
S&T	*Science and technology*
TRL	*Technology readiness level*
TSU	*Tbilisi State University*
TT	*Technology transfer*
UIS	*UNESCO Institute of Statistics*
VAT	*Value added tax*

THE PSF SPECIFIC SUPPORT PANEL

Michael Schlicht, Co-Chair, (Germany): former director of national and international science policies and transformation of higher education systems at the German Federal Ministry of Education and Research (BMBF). In 2000, he became Director of the BMBF's international strategies and worldwide science policies. He initiated programmes in the South African Development Community and Maghreb countries and India. Later, he focused on Eastern Europe, Russia and the Commonwealth of Independent States. Between 2010 and 2016, he co-chaired EU Twinning projects at the deputy minister level with Georgia and Armenia on the implementation of the Bologna Process. From 2012, he co-authored EU Peer Reviews on RTDI Policy Systems in Kazakhstan, Georgia and Ukraine.

Krzysztof Gulda, Co-Chair (Poland): independent expert, council member of the National Centre for Research and Development in Poland, advisor to the Polish Ministry of Science and Higher Education (former member of the Science Policy Committee), former vice-chair of the European Research Area and Innovation Committee (ERAC), former director of the Department of Strategy, Ministry of Science and Higher Education in Poland and director of the Department of Innovation and Economy Development in the Ministry of Economy. He is an expert in the development of national and regional innovation strategies with a strong focus on horizontal relations between innovation and other policies, including research, entrepreneurship, human development, intellectual property and sustainable industrial policy.

Manfred Spiesberger, Rapporteur (Austria): senior researcher at the Centre for Social Innovation (ZSI) in Austria, political scientist specialising in R&D and innovation policies in Eastern Europe, and in evaluations and impact assessments, and Foresight. He coordinated the FP7 ener2i project, which stimulated cooperation among businesses and researchers from the EU and the Eastern Partnership countries on renewable energies and energy efficiency. He was team leader of international review panels on the S&T system in Kyrgyzstan (2015) and Moldova (2011-12).

Maria Nedeva, Expert (United Kingdom): professor of science and innovation dynamics and policy at the Alliance Manchester Business School (AMBS), the University of Manchester and a long-standing member of the Manchester Institute of Innovation Research. Intellectually, her research is on science dynamics, more specifically on 'policy-driven' change that affects both the social conditions (national-level organisation of research) of research and epistemic properties of knowledge. She has researched and published on: universities, governance and management; changing research spaces; the effects of policy on the science system; and evaluation and selection practices in science

The expert team was supported by **Klaus Schuch** and **Marine Chitashvili**, who prepared the background report based on a structure proposed by the rapporteur and revised it according to comments from the expert team. The experts acknowledge the contributions of **Anna Kaderabkova** to the chapter on strengthening science-business links. The experts were also supported by the PSF

Team comprising the PSF contractor (represented by Asel Doranova, project manager at Technopolis Group) and the Commission services (DG Research and Innovation, Unit A4 – 'Analysis and monitoring of national research policies') with Diana Senczyszyn as the contact point from DG Research and Innovation, who coordinated the exercise and ensured liaison with the Georgian authorities. Erik Arnold, Technopolis Group, acted as the quality reviewer.

The Georgian authorities and Shota Rustaveli National Science Foundation of Georgia provided available data and background documentation useful for the panel's work, and also supported its visits to Georgia (i.e. inviting the representatives of government institutions and stakeholders, and providing meeting facilities and interpretation, as required).

EXECUTIVE SUMMARY AND POLICY MESSAGES

The Georgian research and innovation (R&I) system has undergone considerable restructuring in recent years. New intermediate bodies have been established with the Shota Rustaveli National Science Foundation of Georgia (SRNSFG) and the Georgian Innovation and Technology Agency (GITA), which have developed focused support instruments.

Public R&I spending has been increased significantly, although starting from a very low level. Georgia has become associated to the EU's Horizon 2020 programme for Research and Innovation and is successfully implementing Deep and Comprehensive Free Trade Area (DCFTA) with the EU.

Although these measures will help the research and business communities to develop innovative ideas, from an international perspective, overall output and quality remain low.

Georgia is a leader in doing business but a laggard in doing research. Business-friendly regulations, framework conditions and financial support are conducive to entrepreneurship and private investment. In contrast, in the research arena several reforms remain partial or unfinished. Problems such as fragmentation, red tape, lack of funding, a feeble equipment base or weak links between research and business are limiting Georgia's science and innovation potential and its connection with the economy.

Against this backdrop, the **Georgian government requested support from the Horizon 2020 Policy Support Facility (PSF) to catalyse reforms in three focus areas**:

1. Support in the identification of promising research fields (prioritisation)
2. Proposal for the performance-based funding of research entities
3. Measures for narrowing the gap between research and industry/business

An independent panel of experts was appointed by the European Commission (Directorate-General for Research and Innovation) to provide the PSF support. In-depth analysis of background documents, a wide range of interviews with key stakeholders and actors in December 2017 and February 2018, and feedback loops with national authorities and stakeholders led the panel to present the analysis and recommendations in this report.

During implementation of the PSF support action it became evident that the Georgian Science, Technology and Innovation System (STIS) is experiencing **overarching problems** which need to be addressed as a precondition for advancing in the focus areas. These concern notably three dimensions:

1. **Funding arrangements**, including the level and modality of R&I funding and the public organisations involved. The panel considers that the level of funding, in relation to the breadth of the system, is too low to nurture excellence or attract international cooperation. Moreover, it provides little basis for establishing and consolidating fruitful science-business links. In addition, the STIS lacks the stability and continuity in funding needed for

researchers to rely on fair and basic funding and on competition-based opportunities.

2. **Research organisations** and how research is organised in general. Research institutes and universities are not fully integrated, which results in a dual system. Such fragmentation leads to a sub-critical mass in terms of researchers, research facilities and equipment. There is little cooperation between research institutes, research labs and sectoral research units.

3. **Governance of the national research and innovation system**, including the distribution of responsibility and the evaluation regime. In principle, responsibilities within R&I governance, such as priority setting and decision-making on funding, are decentralised. However, there is little freedom or capacity within the system to address these tasks. Because of financial restrictions, university management appears to have experience in 'administration' and not as 'academic entrepreneurs'. It does little to support improved performance by university teachers and researchers. The research evaluation regime is currently seen by many as a "pointless" administrative burden that brings little value to the research-performing organisations, while in an improved scenario it would be a way to reward performance.

These three challenges are important and interdependent. They limit the capacity of the Georgian R&I system to grow, improve on the focus areas, and become more open, dynamic, competitive and impactful.

As regards the three focus areas, a set of key issues remain to be solved:

- **For prioritisation:** reform of the system's governance, especially of the Research and Innovation Council (RIC); developing a properly functioning R&I information system; reducing fragmentation (by establishing R&I centres); aligning R&I priorities to be consistent with economic priorities.
- **For a performance-based research funding system (PRFS)**: introducing adequate base-line funding to support public research organisations and the creation of a level playing field among them; completing the reform of the Academy by integrating research institutes in universities; and upgrading the country's research infrastructure.
- **For science-business links:** ensuring better coordination and complementarity among key stakeholders (ministries and agencies); improving knowledge transfer (via a brokerage network and a favourable Intellectual Property Rights regime); stimulating co-creation via competence centres; tuning funding schemes to the needs of collaborative R&I; and improving the mobility of human resources between research and business.

The **policy messages** stemming from this report are summarised around four groups of issues, which Georgia needs to address over time:

4Cs: Coordination – Concentration – Collaboration – Coherence

In this report, we detail **23 recommendations** to this end. Two of those address overarching problems (low R&I funding and red tape) and the remaining address issues related to the focus areas of this report (prioritisation, performance funding, science-business links). Together, they make up an ambitious agenda that will take a substantial period to achieve.

For the benefit of the Georgian STIS, the panel strongly advises the following steps in the framework of 'Strengthen 4C for Georgia':

1st 'C' - Strengthen Coordination

- Improve the political governance of the R&I system – revise the role of the Research and Innovation Council and make it efficient by streamlining its membership and changing the set-up of the secretariat.
- Create coordination mechanisms for scientific priority setting and implement focused reforms in that respect.
- Stabilise the financial situation of public R&I performers – set up base-line funding based on evaluation and increasingly reward performance, to encourage scientists and innovators to take risks to develop marketable ideas.
- Remove unnecessary legal and administrative burdens and urge science stakeholders to fully exploit their potential.

2nd 'C' - Strengthen Concentration

- Embed R&I policy in the country's overall economic (regional) policy.
- Consolidate the fragmented research system, and finalise the reform of the Georgian National Academy of Sciences (GNAS).
- Concentrate R&I resources – research teams and infrastructure.
- Concentrate on a limited number of R&I priorities.

3rd 'C' - Strengthen Collaboration

- Create communication and coordination platforms to engage all relevant stakeholders.
- Set up a portfolio of financial instruments to promote R&I collaboration.
- Provide physical research infrastructure of adequate quality, and foster innovation-oriented collaboration around it.
- Strengthen collaboration interfaces between public research organisations and businesses.

4th 'C' - Strengthen Coherence

- Guarantee the coherence of governance (authority) structures: define the roles at strategic, operational and performance levels.
- Ensure coherence of base-line funding, open the allocation of base-line funding to all public research organisations (university research labs, research institutes).
- Create coherence across R&I support measures: avoiding fragmentation and duplications, ensuring complementarity and a logic chain from research to

innovation, and securing coordination of support and funding measures among SRNSFG, GITA and Enterprise Georgia.
- Generate stronger links between R&I priorities and economic and strategic priorities.

The detailed recommendations proposed in this report are presented with operational steps that provide concrete guidance.

An action plan is included in the Annex 5 to the report, which shows which recommendations must be tackled in the short-, medium- and long-term perspective to achieve success. An Action Plan is included in the Annex to the report, which shows which recommendations have to be tackled in the short, medium and long term perspective in order to reach success. We provide in Table 1 below a shortened version of this Action Plan for overview.

Table 1: Action Plan (shortened version)

No.	Recommendations		
	short term	mid term	long term
	Chapter 2: Overarching problems of the Georgian Science, Technology and Innovation System (STIS)		
1		**Increase funding for R&I**	
2	**Overcome bureaucracy in R&I**		
	Chapter 3: Prioritisation in Research and Innovation (R&I)		
3	Restructure RIC		
4	Initiate an R&I information system		
5		Establish National R&I Centres	
6		Align priorities for R&I to strategic economic priorities	
7		Develop criteria for the selection of priority R&I fields/areas	
8		Apply reliable methodology for priority selection	
9			Design priority decision-making process
10			Implement priorities through funding and positive incentives
	Chapter 4: Performance based Research Funding System (PRFS)		
11	Introduce base-line funding and create a level playing field.		
12	Fully integrate RIs in the universities		
13			Upgrade the research infrastructure
14	Allocate responsibilities for managing PRFS		
15	Establish a R&I system database		
16		Combine metrics and peer review in PRFS	
	Chapter 5: Science-Business Links (SBL)		
17		Establish a network of brokers and a related back office	
18	Provide clear and simple rules and advice for researchers active in SBL		
19	Ensure a favourable IPR regime		
20		Introduce Competence Centres	
21	Tune R&I funding portfolio towards collaborative R&D		
22		Tax incentives consider only in the longer run	
23		Introduce a research to business fellowship scheme for PhD students.	

The panel emphasises that it is not unfeasible to become a world-class researcher or a successful innovator in Georgia. The presence of several well-performing research institutes and entrepreneurial initiatives in the country provides a good basis for development, and prove that there is latent potential in Georgian science and innovation.

The panel stresses that the science and business community in Georgia expects visible reforms to materialise and be implemented, so that the country can exploit its potential for R&I. It is crucial that these reforms are accompanied by additional resources and relentless efforts to sustain and increase funding for R&I, both from public and private resources.

1 INTRODUCTION

This document presents proposals to improve the effectiveness of the R&I system in Georgia through prioritisation, selectivity and the establishment of working relationships between research and the economy. The report was prepared by an independent panel of experts convened by the European Commission (EC) in October 2017 at the request of the Ministry of Education and Science of Georgia (MES).

According to the terms of reference (see Annex 1), the expert panel was to provide tailored advice and specific recommendations regarding three key areas of science, technology and innovation (STI) policy concern.

1. Support to identify priority research fields/areas
2. Proposal for introducing a performance-based research funding system (PRFS)
3. Suggesting measures for narrowing the gap between research and industry/business

1.1 Approach and methodology

This report, and the recommendations therein, build on the systematic analysis of information gathered by:

(1) Conducting an extensive literature review of existing documentation, including legal and strategic documents, national and international analysis, and statistical data, on the current state of the Georgian R&I system[1].

(2) Review of the general situation in Georgia, and the funding and performance of the country's R&I system, drawing on a background expert report[2].

(3) Meeting, in October 2017, between the expert panel, the authors of the background expert report and representatives of the Georgian authorities. This meeting provided an opportunity to discuss key points in the background report and clarify further expectations regarding the three policy focus areas set out above.

(4) A week-long country visit in December 2017, during which members of the expert panel met and conducted interviews with representatives of the major actors in the Georgian STIS[3]. During these meeting, the panel explored

[1] We would like to recognise the help and invaluable contribution of the Georgian authorities in compiling this information – without it, our tasks would have been much more onerous.

[2] Schuch, K., Chitashvili, M., Spaini, C., Markianidou, P., Doranova, A. (2017). Background Report – Specific Support to Georgia. https://rio.jrc.ec.europa.eu/en/library/specific-support-georgia-–-background-report

[3] The agenda and list of meetings with major actors in December 2017 is available in Annex 2.

stakeholders' opinions regarding the problems associated with the three areas of interest and probed for indigenous solutions and feasibility.

(5) A week-long visit in February 2018, during which members of the panel presented their understanding of the problems experienced by the Georgian research system – more generally, and specifically related to the three areas of interest – and put forward for discussion preliminary ideas for improving the effectiveness of the R&I system in the country through prioritisation, selectivity and the establishment of working relationships between research and the economy. These were discussed with focus groups which included policymakers, public-sector and agency representatives, researchers, representatives of business, and NGOs.

This report was further informed by the academic literature on R&I systems, funding modalities and arrangements, prioritisation of research and methodologies for establishing priorities, selectivity and performance-based research funding, and academy-industry links. It has also made full use of the wealth of practical experience and expertise in science policy among the members of the expert panel.

1.2 Scope of the report

The report, in accordance with the terms of reference, focuses on developing a set of proposals to improve the effectiveness of the country's R&I system through the prioritisation, selectivity and establishment of working relationships between research and the economy.

However, during the interviews conducted in the first visit to Georgia, it became evident that the Science, Technology and Innovation System (STIS)[4] has some over-arching problems related to funding arrangements, organisation of research, and governance structures that make it hard to address the three areas of interest in this study. **Addressing the key overarching problems is a necessary precondition for resolving issues associated with prioritisation, introducing PRFS and incentivising the links between research and business**.

We therefore felt it necessary to extend the scope of this report to include an analysis of the overarching problems of the STIS in Georgia and, where appropriate, propose ways to tackle these problems. We have discussed the proposed solutions as far as possible in conjunction with our areas of interest for which these are a precondition.

[4] Here and throughout the report the use of STIS instead of National Research and Innovation System (NRIS) is intentional to indicate that it is necessary to reconsider Georgia's entire science, technology and innovation system, taking a wider perspective beyond R&I.

1.3 Structure of the report

This report consists of four substantive parts. In chapter two, we describe the over-arching problems of the Georgian STIS, place these in four distinct groups and elaborate on a set of systemic problems that, while not always urgent, are important to address over time. These problems were identified by an analysis of the information collected during our first visit to Georgia and tested in the focus groups during our second visit. To structure the presentation of the overarching problems, we used a framework for the analysis of STIS along three dimensions: funding arrangements, research organisations and governance (Nedeva et al., 2013)[5].

Chapters three, four and five deal in detail with the issues around prioritisation, introducing a PRFS and improving the links between research and industry. We begin each chapter by setting out preconditions for progress.

Following these three chapters, we offer recommendations for specific actions, approaches and arrangements for achieving improvement. Thus, we have proposed ways for identifying, agreeing upon and enforcing workable priorities; options for introducing selectivity in research funding (PRFS); and arrangements to enable and sustain the links between research and business/industry.

We conclude by developing a detailed action plan (see Annex 5) for transforming Georgia's R&I system and aligning its operation with the country's needs and aspirations. The action plan summarises the recommendations and classifies them according to those to be tackled in the short-, medium- and long-term perspective. We have layered the recommendations to reflect their sequence and level of urgency. When detailing the recommendations, we have also carefully considered the country's implementation capacity.

[5] Nedeva M., Thomas, D., Caswill, C., Nielsen, K. (2013). Study of Research Funding Trends and Practices of Research Funding Organisations: Report to the Swiss Science and Technology Council.

2 OVERARCHING PROBLEMS OF THE GEORGIAN SCIENCE, TECHNOLOGY AND INNOVATION SYSTEM

In this chapter, we set out our understanding of the overarching problems of the Georgian STIS. These problems are important in the extent to which they affect the capacity of the system to deal with issues around prioritisation, introducing a PRFS and improving the links between research and business.

We have used a combination of conceptual assumptions (e.g. an analytical framework) and empirical accounts to identify the key overarching problems of the STIS and to elaborate a range of workable solutions.

Many of the overarching problems of the Georgian STIS discussed here were either signalled, or confirmed, during interviews with relevant stakeholders. While there was some discord regarding the severity of the problem, or the ways in which this could be resolved, there appeared to be broad consensus across stakeholders as to the nature of the key problems within the Georgian STIS.

2.1 Analytical framework

To identify the key problems of the STIS and its relationship with Georgia's industry and economy, we have used a conceptual framework with three dimensions (Table 2)[6].

- Funding arrangements, including the level and modality of funding and the organisations involved in R&I funding.
- Research-performing organisations and how research is generally organised.
- The governance rules used to regulate exchange relations between 'principals' and 'agents', and to assign jurisdiction to specific agents and principals over designated areas (e.g. stipulating the kind of research to be performed in a specific organisation or assigning the right to a specific principal to fund research of a kind).

We can present these dimensions in a framework, as shown in Table 2 below:

[6] These three dimensions have been elaborated using the intellectual assumptions of a notion of science dynamics that brings together the intellectual and social conditions of science. This notion views science as an interaction between research spaces and research fields and the dynamics of science as originating in sets of tensions between these (Nedeva, 2010; Nedeva 2013).

Nedeva, M. (2010). Public Sciences and Change: Science Dynamics Revisited, in Janusz Mucha and Katarzyna Leszczynska (eds.) Society, Culture and Technology at the Dawn of the 21st Century, Cambridge Scholars Publishing: Cambridge.

Table 2: Three dimensions of R&I systems

Funding arrangements				Research-performing organisations	Governance	
Level	Modality	Origin	Research-funding organisations		Distribution of responsibilities (authority rights[7])	Evaluation
High Medium Low	Base-line funding Project funding Mixed	Private, public National internati onal	Government / ministries Funding agencies Research performers / disseminators (in exchange for funding)	Research organisations (e.g. universities, RIs, etc.)	Which actors: Decide on funding (how much goes where) Decide on research priorities (including infrastructure) Act (on funding and/or priorities)	Evaluation system? Peer review? indicators? Is it linked to funding?

In the text below, we will use these dimensions to categorise and discuss a range of overarching issues (problems) associated with Georgia's R&I system.

2.2 Funding arrangements for science, technology and innovation in Georgia

2.2.1 Level of funding

There are two principal approaches to measuring the level of public funding for research: using absolute amount and/or relative proportion.

We believe the most straightforward approach is to use relative categories: high, medium or low. Looking at statistics, research systems where **Gross Domestic Expenditure on Research and Development (GERD)[8]** as a share of Gross Domestic Product (GDP) **is below 1 % ought to be treated as 'low'**; similarly,

[7] Authority rights describe the jurisdiction of participants in the system over parts and aspects of it. In the case of the STIS, this would include the authority of actors to decide on research funding, research priorities, etc.

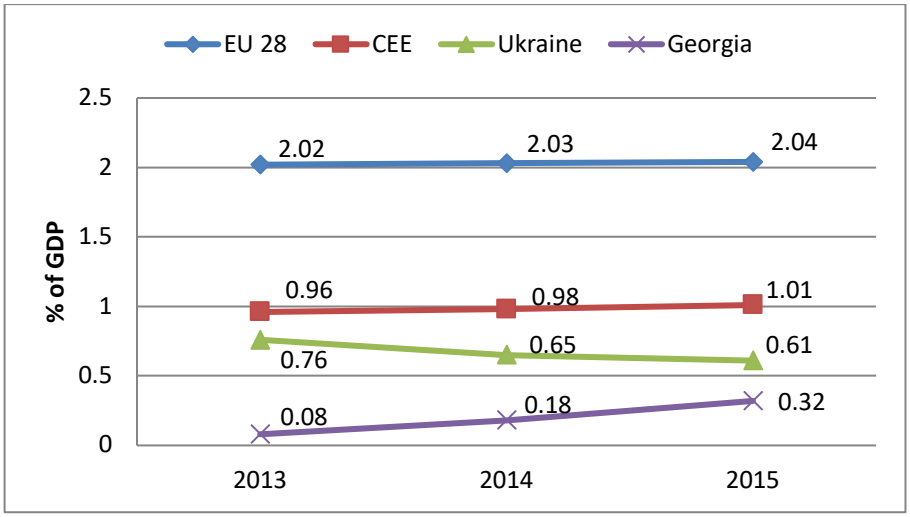
[8] That is, including both public and private R&D spending, for details see http://www.oecd-ilibrary.org/sites/sti_scoreboard-2011-en/02/05/index.html?itemId=/content/chapter/sti_scoreboard-2011-16-en; the OECD average is currently 2.3 %.

systems where the share of funding for research and development (R&D) is **between 1-2 % would be classed as 'medium'** and anything **above that would be classed as 'high'**.

Georgia is firmly in the 'low' level of research funding group of countries. In fact, it would be fair to say that the level of funding for research in Georgia is very low (and has been for many years since the country's independence). Having said that, we ought to recognise that R&D expenditure in Georgia has increased substantially in recent years. GERD as a share of GDP rose from 0.08 % in 2013 to 0.32 % in 2015.[9] Funding for innovation activities and higher salaries for researchers largely account for this increase[10].

If we compare Georgia's GERD with international benchmarks (Figure 1), we can see that, in 2013, Ukraine was spending nearly 10 times more (in terms of GERD of GDP, which was 0.76 % in Ukraine). By 2015, this gap had narrowed to twice as much. In 2015, the Central and Eastern European (CEE) region (according to UNESCO Institute of Statistics – UIS – categorisation) was spending 1.01 %, which is about three times more in percentage of GDP than Georgia, and the EU-28 countries were a long way ahead at 2.04 %.

Figure 1: GERD as a share of GDP for Georgia and selected benchmarks[11]



Please note that the statistics for Georgian GERD are not complete; they do not include private non-profit and business-enterprise funding. However, the real GERD is considered to be not significantly higher, as private R&D funding by the

[9] UNESCO Institute of Statistics (UIS), http://data.uis.unesco.org/; data accessed on 11 January 2018.

[10] The business share of expenditure on R&D (BERD) is not clear, as company surveys have yet to be implemented with all the necessary detail.

[11] Data for EU-28 countries, EUROSTAT http://ec.europa.eu/eurostat/data/database; remaining data UIS, data accessed 2 June 2018.

business-enterprise sector is estimated by experts and the government as being rather low. Public spending on R&D is estimated to have reached 0.3 % of GDP in 2016, thereby, in absolute figures, amounting to 72 million Georgian lari [GEL] (EUR 27.4m)[12].

Usually, countries where the level of funding for R&I is so low are not able to participate in the international 'division of research effort' and their economic development cannot depend on the national research system and innovation.

2.2.2 Modality of research and innovation funding

There are two 'pure' modalities for research funding (Braun, 2003; Slipersæter, Lepori; Dinges, 2007)[13]:

- **Base-line funding for research allocated directly to universities** and/or research institutes. This funding may include researchers' salaries but as a rule it goes beyond that to cover resources for conducting research, maintaining infrastructure, etc. In a growing number of developed research systems, base-line funding (also referred to as 'block grant') is subject to selectivity.
- **Project and/or programme-based funding**. This is usually channelled through competitive research grants allocated to individuals or research groups.

These two modalities have very different functions in research systems. While base-line funding provides a necessary level of stability to researchers, research groups and research organisations, and affords risk taking in research and the opening of new individual and collective research lines, project-based funding provides flexibility in research.

Both funding modalities are necessary for maintaining a healthy R&I system. Hence, it is unlikely that an STIS relying exclusively, or even disproportionately, on one of these would exist and be able to maintain a prosperous research system. Usually, national research systems rely on a combination of these two funding modalities[14].

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[12] Schuch et al., (2017). Background report. Conversion to EUR at December 2016 via http://ec.europa.eu/budget/contracts_grants/info_contracts/inforeuro/index_en.cfm

[13] Braun, D. (2003). Lasting tensions in research policy-making – a delegation problem. Science and Public Policy, 30(5), 309-321; Slipersæter, S., Lepori, B., Dinges, M. (2007). Between policy and science: research councils' responsiveness in Austria, Norway and Switzerland. Science and Public Policy, 34(6), 401-415.

[14] Lately, the proportion of project-based, competitive funding in European countries has been increasing relative to the proportion of base-line, block grants funding. Nevertheless, Switzerland allocates over 70 % of its research funding as base-line funding while the UK, on the other hand, allocated less than 45 % of its research budget as base-line, block grants funding.

Currently in Georgia, the universities, their research labs and research institutes (RI) are funded as follows:

- Universities and their research labs are funded by student fees[15] determined by the government; public universities have no right to increase the fee level, but they may decrease it (which is applied; furthermore, private universities can change their fee level in both ways).
- There is de facto ***no base-line research funding allocated by ministries or funding agencies to research labs established by the universities.***
- Some universities (e.g. Ilia State University) cross-subsidise their research labs using income from fees.
- The former research institutes of the Academy of Sciences and/or ministries that were integrated into universities are funded separately to a level that accounts only for staff salaries (at a low level). ***In Georgia, this is considered to be 'base-line funding' but it does not match the standard definition of 'base-line funding' provided above*** *(meaning it does not go beyond basic salaries).*
- Competitive research grants from the SRNSFG.
- Competitive innovation funding via the GITA, Enterprise Georgia and banks.

On the surface, there appears to be mixed funding of R&I in Georgia: project-based funding from the SRNSFG, GITA and Enterprise Georgia, and funding for research institutes (RIs) from the Ministry of Education and Science (MES) and the Ministry of Economy and Sustainable Development (MOESD). The Foundation also provides the resources for updating and maintaining the research facilities and infrastructure. ***In reality, there is no base-line funding for research in Georgia since the resource allocations from MES and MOESD are calculated to cover only the researchers' salaries at a fairly inadequate level.***

In developed, and highly-performing research systems there is always a mix between base-line research funding for organisations and competitive project-based research funding. Some of the highest-performing R&I systems in the world maintain a high level of base-line funding for organisations (e.g. in Israel and Switzerland, close to 70 % of the operating budget of universities is from block grants).

Experience elsewhere demonstrates that imbalance between funding modalities, such as almost 100 % project-based research funding, is problematic because the research system lacks the necessary level of stability, it becomes impossible to maintaining research capacity (e.g. training new researchers, maintaining facilities and equipment, etc.) and the system becomes starved of elementary resources (e.g. heating, energy, etc.).

[15] Tuition fees paid by the ministry are calculated and expected to be spent on education. However, as in many countries, this fee is a hidden source of financing research, as university staff are expected to perform some research activities within their contract.

2.2.3 Origin of funding for research and innovation

Research systems differ according to the proportions of public/private and national/international funding flowing through them.

At present, it is difficult to form an opinion on the origin of research funding in Georgia because reliable data are hard to come by. Most public funding originates from MES, from which around 50 % has been disbursed through competitive funding procedures by the SRNSFG. The MOESD has contributed GEL 5.6 million (EUR 2.13 million). Around half of the state's R&D funding can be regarded as institutional funding[16] which covers researchers' salaries and running costs for the former research institutes of the Academy of Sciences, and sectoral institutes under the ministries. The other half is competitively awarded by SRNSFG[17].

We know that there is some funding from industry (mainly service contracts and banking) but this does not appear to be a developed stream for research funding. It is not financially substantial and not dealt with strategically at university and institute level.

We also found isolated cases where research funding from abroad, mainly US and EU funding sources, plays key role for the vitality of the lab/institute. However, the success of these units in attracting research funding from abroad may be hard to replicate because of variations in field, background and personal characteristics.

In terms of origin of research funding, a major problem is the lack of reliable data and statistics[18]. The low level of funding from local industry and the ad hoc attraction of international funding are also matters of concern.

2.2.4 Research and innovation funding bodies

Research systems, and their performance, can differ considerably depending on the level of diversity of funding organisations present. These can include the following: ministries, research funding agencies (singular and composite), charities, NGOs, private funders and industry.

The level of diversity of R&I funding bodies and instruments in Georgia has increased significantly in recent years, especially at the agency level. SRNSFG instruments have been expanded, and innovation funding has been added by establishing GITA, Enterprise Georgia and via banking. Other funding sources, including private and business, charities and NGOs, remain limited. While

[16] Please note that 'institutional funding' is different from 'base-line funding for research' in that it is defined by its destination. In other words, all base-line research funding is also 'institutional' but not all 'institutional' funding is 'base-line research funding'.

[17] Schuch et al., (2017). Background report.

[18] We believe that some progress has been made in this area but it is still very much a 'work in progress'.

diversity has increased, it is still necessary to stimulate private/business research funding.

2.3 Research organisation

It is also important to consider the kinds and mix of research performers present, such as research institutes, universities, think-tanks, national labs, academies and business.

In Georgia, research is carried out in the following organisations:

- Universities through their research labs that have been traditionally within the universities; such labs are situated at the leading public universities (Ilia State University, Georgian Technical University, and Tbilisi State University).
- Universities through the former Academy of Sciences' research institutes.
- Sectoral research organisations and institutes which are a mixture of private and public organisations. This category includes leading research players such as the Eliava Institute.
- To a limited extent in the private sector (business and NGOs), but we have to rely on anecdotal evidence (no data).

In an analytical understanding, the first two types of research organisations (research labs and institutes) fall under the category of scientific institutes, while the third, sectoral research organisations and institutes, can be classified under research and technology organisations (RTOs).

The organisation of research underwent a substantial reform as from 2011, when the research institutes (mostly from GNAS and ministries) were either merged into the universities, closed, became independent or remained under the ministries. Most of the research institutes (around 50) were integrated into the main seven public universities[19]. In 2014-15, the MES assessed these institutes based on their long-term proposals for R&D to be performed (10-year plans), and allocated more funding, increasing researchers' salaries approximately three-fold.

There is plenty of evidence, however, **that this reform is incomplete**. For instance, the former RIs at the GNAS are only formally integrated into the universities, when in practice they operate as separate units, with different rules for funding, employment contracts and reporting demands.

An interesting feature of Georgia's STIS is that certain research groups have managed to bypass their national research system by attracting research funding and collaborating with colleagues from abroad. These research groups are, according to local accounts, successful and internationally visible. While by all

[19] Bonas, G., Curaj, A., Gajdusek, F., Nedovic, V., Schlicht, M., Kechagiaras, Y. (2015). Policy Mix Peer Review of the Georgian STI system.

accounts this is a positive development, we consider it provides valuable policy messages.

We believe the main problems here are that the research institutes are not fully integrated into the universities; research performers are fragmented thematically and physically; research infrastructure is fragmented; and there are tensions between different research actors.

2.4 Science, Technology and Innovation System governance

Governance is the third important dimension of national R&I systems. This comprises 'authority rights' arrangements and provisions for a research 'evaluation' regime.

2.4.1 Distribution of responsibility for science, technology and innovation (or authority rights)

Distribution of responsibility, or authority rights[20], is the expression of distribution of power vested in actors in the research system to:

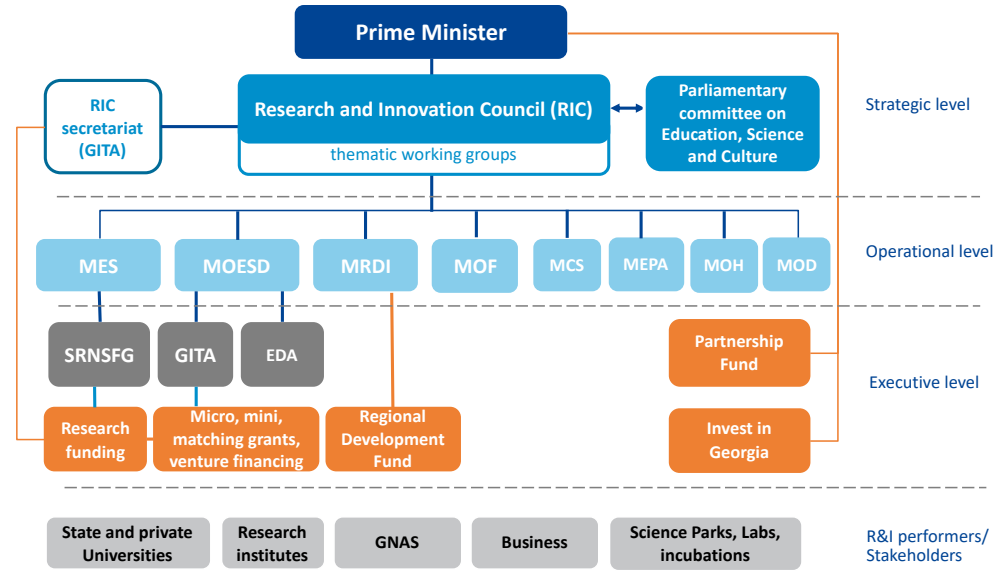
- decide on funding;
- decide on research priorities (including infrastructure issues); and
- act (e.g. to distribute grants).

This distribution of responsibilities is the mechanism through which priorities are decided and implemented in the STIS. These also provide the opportunities and limitation for designing and implementing research evaluation systems (performance-based research funding system).

Grasping the distribution of responsibilities, strategic, operational and executive, in the Georgian STIS has probably been the most challenging part of our work. Figure 2 presents the current structure of the STIS in Georgia and indicates the nominal distribution of responsibility.

[20] Please note that in this part of the report 'division of responsibilities' and 'authority rights' are interchangeable.

Figure 2: Georgian STIS structure and distribution of responsibility



MES – Ministry of Education and Science
MOESD – Ministry of Economy and Sustainable Development
MRDI – Ministry of Regional Development and Infrastructure
MOF – Ministry of Finance
MCS – Ministry of Culture and Sports
MEPA – Ministry of Environmental Protection and Agriculture
MOH – Ministry of Labour, Health and Social Affairs
MOD – Ministry of Defence
SRNSFG – Shota Rustaveli National Science Foundation of Georgia
GITA – Georgian Innovation and Technology Agency
EDA – Enterprise Development Agency (Enterprise Georgia)
GNAS – Georgian National Academy of Sciences

Source: MOESD and GITA with adaptations by authors

The top-level coordination body is the Research and Innovation Council (RIC), which was created in 2015. The RIC is chaired by the prime minister and the members are the ministers of the MOESD, MES, finance, foreign affairs, justice, regional development and infrastructure, defence, labour, health and social affairs, agriculture; heads of the two parliamentary committees; three business representatives, the president of the National Academy of Science, the director of the SRNSFG, the director of the IPR Agency (National Intellectual Property Center of Georgia - Sakpatenti), and four scientists. In this respect, the RIC is rather large in terms of members. The executive secretary is the director of GITA, which also provides the operational support for it. The RIC does not have its own budget. One of its main tasks is to identify Georgia's thematic priorities by government decree, which has yet to be done.

Until now, the **RIC** has proved limited in its operational capacity. It is **not yet carrying out strategy and broad policymaking,** but is solving lower-level practical issues. In 2017, the RIC met twice, in both cases to decide on innovation-related matters; one meeting was on crowdfunding and the second on whether it should be possible for an actor from abroad to be a GITA beneficiary. The RIC's work is rather imbalanced in that it is focused on the innovation sphere, which reflects the leading role of GITA in its management, and

the priority that top government actors attach to innovation activities compared to research. Once again this confirms our finding that R&I are somewhat separated, and are not managed and working in an aligned and synergetic way.

Looking at Figure 2, and based on our interviews with representatives from all the relevant organisational actors in Georgia, the following is worth noting:

(1) The RIC, the Office of the Prime Minister and the Parliamentary Committee on Education, Science and Culture, nominally, represent the strategic level in the system.

(2) In effect, our investigation indicates that the RIC has not lived up to its strategic responsibilities. It does not meet often enough and its large and extensive membership means that decision-making is almost impossible.

(3) RIC's weakness regarding strategic matters in the system has been offset by the Office of the Prime Minister taking on further responsibility. Unfortunately, this is where the strategic, operational and the executive start to blur. Following numerous discussions with stakeholders in Georgia, our impression is that the operational, and even the executive, have come to dominate, and even replace, the strategic[21].

(4) The operational, or ministerial level in the system is fragmented and there is no coordination of policy[22].

(5) The executive level is well developed (mainly through the two agencies SRNSFG and GITA) but it reflects, and suffers from, fragmentation at the operational level.

We believe that these deficiencies at strategic, operational and executive level ought to be addressed to allow for positive changes in the STIS in Georgia. The two major issues here are the **need to strengthen the strategic level and to develop, and implement, measures for coordination and cooperation at the operational level**.

Another matter worth noting is the position of Georgia's universities in the STIS. According to the country's legal framework, universities in Georgia are autonomous[23]; this means that they have complete discretion over their

[21] One theme that was voiced in most accounts of the role of the Office of the Prime Minister was the need to have its approval for purchasing equipment and submitting research proposals to international funding bodies.

[22] Ministers meet at RIC sessions which, even assuming this body fulfilled its strategic functions, is not the level at which operational policy happens. There is no mechanism to coordinate ministerial policy at the departmental level.

[23] The principle of autonomy of the higher educational institutions is stipulated in the Law of Georgia on Higher Education as one of the leading principles of the national higher education system. See more at https://eacea.ec.europa.eu/sites/eacea-site/files/countryfiche_georgia_2017.pdf, Sections 1.6, 2.1. and 2.2.

recruitment, teaching and research activities. However, our meeting with the university rectors indicated the following:

(1) University leadership appeared to have little leadership experience. Most of their activities are better described as 'administration' rather than 'leadership'.

(2) Externally, university leaders have authority mainly as part of personal histories and trajectories.

(3) Internally, university leadership has very limited strategic capacity because there is no strategic budget in the organisation that can be used to trigger changes. Tuition fees are just about enough to cover recurrent spend (salaries, basic facilities) while research funding only covers research staff salaries at a very low level.

Hence, we assume that the autonomy of Georgian universities is in fact restricted rather than enhanced (as the discourse goes) by previous rounds of reforms. ***The universities can be truly autonomous only when involved in structural and policy arrangements that incentivise them to exchange knowledge for funding, thereby making them active contributors to society and economy.***

To summarise, the three governance problems of Georgia's STIS likely to affect its ability to introduce research priorities, implement a PRFS and bridge the gap between research and economy are:

(a) unclear strategic, operational and executive responsibilities;

(b) fragmentation at the operational and executive level; and

(c) universities' limited strategic and leadership capacity while assuming autonomy.

2.4.2 Evaluation

Evaluation is an essential element of the governance dimension of public policy. This is also the element that links most immediately and directly with the issue of performance-based public funding.

Not so long ago, evaluation was a very small element of research governance. **In almost all contexts, it was used only to award project or programme funding** (e.g. the competitive, project-based modality of funding as peer review and follow up on results). Public authorities are now relying increasingly on governance through evaluation, as evidenced by the introduction of national-level evaluation systems (Whitley and Glaser, 2007)[24].

[24] Whitley, R. and Gläser, J. (eds.) (2007). The changing governance of the sciences. The advent of research evaluation systems. The Netherlands: Springer.

National evaluation systems are generally associated with the selective allocation of base-line research funding to research organisations and characterise PRFSs. An example of such a system is the Research Assessment Exercise currently operating in the UK (see Barker, 2007)[25].

Our research provided evidence that research evaluation is still problematic in Georgia. These problems concern the peer-review-based systems operated mainly by the SRNSFG and GITA, as well as evaluation above and beyond.

Basic principles of peer review are being challenged in Georgia. An example we want to highlight is the issue of the confidentiality of reviewers: it is with good reason that international practice to not disclose the name of reviewers of individual projects[26]. This very important principle was challenged in court last year, and is again being challenged in 2018. **We are fully in line here with the letter from the SRNSFG International Supervisory Board of 3 April 2017 to the Minister of Education and Science, which requests that the confidentiality of reviewers is respected for the benefit of Georgia's science system.**

Research performance evaluation, is carried out to a degree by the GNAS. This, according to local accounts, resembles more of an administrative reporting procedure than an evaluation system akin to those employed elsewhere. To begin with, reporting is conducted using descriptive narratives; no explicit indicators, qualitative or quantitative, are specified[27]. Our interviewees reported that there is no follow-up on the evaluation and that its outcome is not linked to any funding or other decisions[28]. **This is most likely because this evaluation is carried out by the Academy of Science which, as a reputational rather than an executive body, is unable to reconcile the results of the evaluation with policy action.**

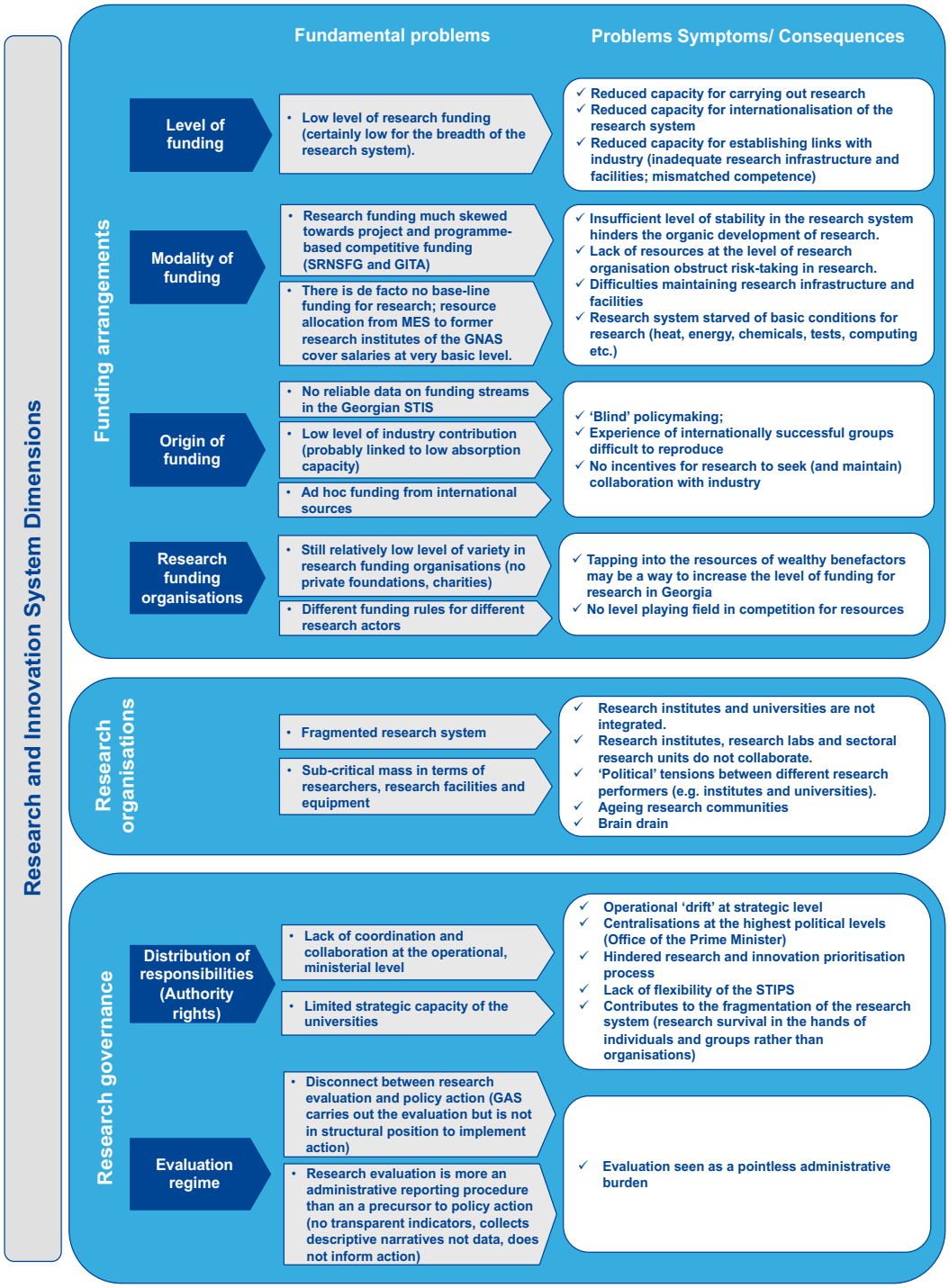
[25] Barker, K. (2007). The UK Research Assessment Exercise: the evolution of a national research evaluation system, Research Evaluation, Vol. 16, Issue 1.

[26] Only if confidentiality is guaranteed can reviewers go about their work without fear that they will be harassed subsequent to funding decisions. Experts will abstain from performing reviews, if names are disclosed; the whole merit-based system of project selection will be undermined herewith. According to good practice (and similar to the EC in its Horizon 2020 programme), SRNSFG publicises the list of reviewers who have been consulted for reviews in its programmes, but it does not provide the names of reviewers of individual projects.

[27] We also could not find evidence that this information is being processed and assessed in a systematic and transparent way.

[28] In fact, a director of Georgia's research institute mentioned that, although it stopped filling in the evaluation report years ago, there have been no discernible consequences.

Table 3: Overarching problems of the STIS in Georgia



2.5 From problems to solutions

First, we would like to acknowledge how much has already been achieved in terms of the positive transformation of the R&I system by the Georgian authorities. Within a relatively brief time, innovation funding has been introduced via GITA, public expenditure on R&D has been increased, SRNSFG has been established as a solid research funding agency with a useful portfolio of instruments, and some improvements in R&I statistics can be observed. These formidable achievements give us the confidence to formulate proposals to address several the problems identified in the previous sections of this report. We are also aware that tackling these problems is no trivial matter and it will take political will, determination, resources and time.

Previously in this chapter we discussed, and clearly formulated, the overarching problems of the Georgian STIS. This analysis followed our understanding, confirmed by discussions with stakeholders in Georgia, that these problems, or at least some of them, are likely to impede progress in establishing and supporting priority areas of research, developing and implementing a PRFS, and bridging the gap between research and the economy. It was informed by extensive empirical work and framed by analytical assumption regarding key dimensions of the R&I system.

In section 2.6 of this report, we presented a concise overview of these problems distinguishing between two types: those that are fundamental to the STIS in Georgia and second-order problems that we termed 'problems/symptoms or consequences'. This, we believe, is an important distinction because it brings to the fore an important policy message: improving the effectiveness of the STIS in Georgia is conditional on addressing its fundamental problems and problems/ symptoms in a sequence.

Having identified a wide spectrum of problems, we take forward to discuss more comprehensively just eight of these. They were selected in relation to our core task of developing a set of proposals to improve the effectiveness of the R&I system in the country through prioritisation, selectivity and the establishment of working relationships between research and the economy.

In this section, we deal with two fundamental problems in the system which cut across, and affect, all three areas of concern. These are the **low level of funding for R&I and the apparent high level of bureaucracy in the Georgian system**. The other six problems have been framed as preconditions for prioritisation, selectivity and the establishment of working relationships between research and the economy, and thus addressed in the relevant sections.

2.5.1 Low level of research funding for research and innovation

While discussing the level of research funding in Georgia's research system is not within the immediate remit of this expert group, this matter ought to be raised. While there are no reliable statistics on the overall level of R&I funding, we know that although public funding for research has increased over the last three years, it remains low at about 0.3 % of GDP, and funding from local industry is negligible. There is also evidence that most research organisations in the country,

with the exception of some private research institutes, are struggling to raise the resources necessary to cover their operational costs.

Experience elsewhere demonstrates that when public funding for research is very low and thus does not allow the research system to perform research and reproduce itself, the research system rapidly loses capacity thereby becoming unable to attract research funding from non-governmental sources (e.g. from abroad, from local and foreign business). These tendencies can be observed in Georgia; its R&I system is marked by a constant downsizing and ageing of the research personnel, qualified and young researchers leaving the country, research groups and teaching departments falling below critical mass, low R&I performance, and low business investment in R&I. The authorities have recognised some of these trends, stating in the Social-economic Development Strategy (2014) that "both government and private-sector spending on research and development remain low"[29].

What makes the (ultimate) increase in public funding for research a necessity is not that researchers and research organisations' leaders complain, but that a sub-critical level of public funding for research is inherently wasteful – it prolongs the agony of a declining system. This inevitable decline in research capacity also adversely affects higher education and the skill and competence set of the labour force, as well as the country's innovation potential. **Without adequate funding, there is a risk that the whole higher education and research system will whither away, with serious consequences for the economy and the entire country**.

2.5.1.1 Recommendation 1: Increase the funding for research and innovation

Despite recent funding increases, we believe that further decisive measures are required to stabilise and strengthen the R&I system, which has been shrinking and losing capacity. An increase in funding must be seen in the light of the further recommendations within this report. Reforms of the Georgian R&I system we suggest along the lines of prioritisation, introducing a PRFS, and bridging the gap between research and economy in the system are predicated on funding the system adequately, if not generously. Therefore, this problem of underfunding should be addressed promptly even if solving it may take time.

The good efforts, which have been observed over the last three years in increasing R&I funding, should be continued. Certain **funding targets should be set**: initially, to reach 0.5 % public and private R&D funding (GERD) of GDP, and projecting further increases to reach at intervals, e.g. 1 % of GDP. This is a

[29] Government of Georgia (2014). Social-economic Development Strategy of Georgia – 'Georgia 2020'. This was highlighted again in the more recent S&T strategy: Ministry of Education and Science (2017), S&T strategy.

level of R&D spending that countries in the Central and Eastern European region achieve[30].

There should be better use of available funds by prioritisation and avoiding fragmentation. This would involve correcting the mismatch between the needs of the R&I system and the ability of the state to meet these needs by focusing on a small number of priority areas. This should involve the prioritisation of research fields and groups decided by considering both research excellence and broader concerns around wealth creation and quality of life.

The proactive, state-level **attraction of R&I funding from abroad** (e.g. H2020, EU European Neighbourhood Instrument – ENI; prioritisation of R&I required towards the EU for cooperation) should also be continued and developed further. A move in this direction has been the association of Georgia to the EU's Horizon 2020 R&I funding programme. Here, in particular, those schemes targeted at countries with lower participation (Widening programme) and mobility schemes (Marie-Skłodowska Curie schemes) should be promoted to the local research community.

Another option, which should be followed, is via the ENI which requires the prioritisation of R&I in the cooperation policy with the EU. Horizon 2020 is already included in the ENI, while it is planned to integrate science-business links in autumn 2018.

Private R&I funding needs to be stimulated. In the 2017 S&T strategy, the low level of R&D funding was confirmed once again, and the private sector identified as a source of funding. The necessary preconditions and stimulation measures (e.g. via co-funding) need to be established to this end. Such measures are proposed under the Science Business Links (SBL) chapter on the applied research scheme and innovation vouchers.

At a later stage, we may assume that the Georgian state has amassed sufficient wealth to be able to increase research funding significantly in both relative and absolute terms. Georgia's R&I system can begin to grow again with a healthy regard to priorities.

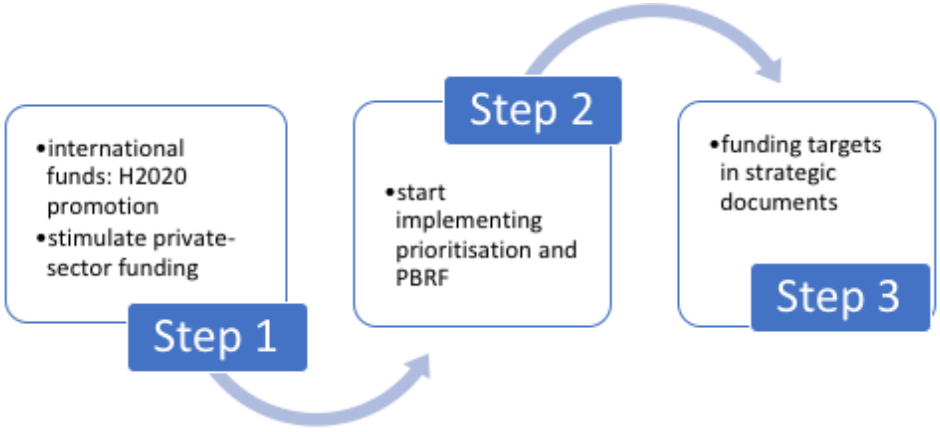
Key operational steps:

- Actively attract funding from abroad and continue the good efforts to adapt the Georgian rules for facilitating international grants.
- Stimulate research-business cooperation and private-sector co-funding of research via opening public R&D funding to business and appropriate funding schemes.
- Make better use of available funds, by implementing the recommendations for prioritisation and PRFS.

[30] According to UNESCO Institute of Statistics (UIS): see database http://data.uis.unesco.org/

- Revise the national strategic documents and include specific R&I funding targets.

Figure 3: Activity line for increasing R&I funding



2.5.2 High level of bureaucracy in Georgia's Science, Technology and Innovation System

During our first mission to Georgia, we were surprised to learn that doing research is administratively cumbersome and characterised by over-regulation and red tape. This is in stark contrast with the country's achievements and reputation for ease of doing business.

Several **bureaucratic hurdles in carrying out research were reported**; worryingly, many of these were reported by SRNSFG grantees whose research was delayed and/or became more expensive. Issues around excessive bureaucracy and administrative control are strongly associated with the rules for public procurement. While we appreciate the need for strict financial control, and introducing procurement and a financial accountability system that meets the EU's expectations and requirements, we also believe that there is a need for rationalising current legislation. Introducing a procurement and accountability system that is restrictive and prohibitive not only hampers R&I activities in the country, and increases the costs of research, but it also creates incentives to attempt and bypass the system altogether.

In some cases, the problems also seem due to the lack of information on regulations, grant rules and the procurement rules among research managers and researchers (e.g. in the case of online purchases).

Below are some examples to illustrate the situation as it currently stands; these were reported during our interviews and stakeholder meetings in Georgia.

Procurement

Example 1: A researcher was awarded a grant from SRNSFG. This included funding for the purchase of equipment: a computer costing approximately EUR 1 000. This purchase had to be approved by the Office of the Prime Minister which has delayed the decision for months. Meanwhile, the recipient of the grant has not been able to progress with his research.

Example 2: Georgian universities are not allowed to make any prepayment without a bank guarantee letter from the company they are buying equipment from. If the purchase is for more than a minimum of USD 100 000 (EUR 80 509)[31], companies are providing such a letter. However, for smaller orders they are not happy to waste the time and money on this requirement. So the university is opening a call and some intermediate (usually Georgian) companies are getting this order. They are prepaying for the foreign companies, importing the equipment or goods, and then the university is paying them by which time, of course, the price has increased by at least 15-20 %. Quite often, such companies have limited capital and cash flows, and are waiting for previous payments to transfer money for purchases. Thus, the existing system makes funds allocated for science less efficient.

SRNSFG rules

Example 1: Another example concerns the institute of seismology which needed to purchase critical equipment for seismic monitoring. This equipment could only be bought towards the end of the grant period, because the grant was split into many smaller payments over the implementation period – the equipment budget had to be accumulated over time. This is obviously an obstacle to completing the research funded by the grant.

Example 2: A young PhD student in the health field needed to buy specific tests with her grant. The procedure for approval of this purchase proved to be quite lengthy. As a solution, the student had to use grant money for personal costs to buy the required tests because she could not wait for months to be allowed to buy them.

2.5.2.1 Recommendation 2: Overcome the bureaucracy and ease the administrative burden for R&I

Experience elsewhere demonstrates that successful R&I systems are usually characterised by a low level of bureaucracy, a high level of flexibility and reasonable accountability and procurement rules[32].

Hence, we believe, that the Georgian R&I system would greatly benefit from reconsidering its procurement and accountability rules, and its implementing

[31] Exchange rate for February 2018.

[32] For example, in Poland, the institute directors can decide on spending on R&D-related goods and services, and are responsible for public procurement. This is at a much lower level compared to Georgia, and the Prime Minister's office, and makes the system more flexible and administratively lighter.

measures to **ensure that conducting research is not hampered by bureaucracy, and that it is administratively made as easy as possible**. A similar path should be taken as that in the field of economy and business. Framework conditions need to become conducive to the performance of R&I, and managerial staff should facilitate it.

We, therefore, recommend that the Georgian authorities revise the rules and administrative procedures applying to R&I. Furthermore, the accountability, and other, demands and requirements at ministry-level, agency-level and university-level administration should be kept to a minimum and coordinated. Information for researchers and training measures for research managers on the applicable rules should be considered. In this way, Georgia could take pride in providing a favourable environment for research as well as for business.

We are aware that there are some positive developments in this respect which are ongoing. For example, the Parliamentary Committee on Education, Science and Culture is willing to facilitate and support R&I activities and, during our meetings, declared its readiness to provide support with public procurement in H2020-funded grants. Although the actual decree or amendment is not in place yet, it is already included in the MES strategy and work plan and is currently under preparation. It is possible to note exceptions to procurement rules for the purchase of equipment and other issues but this does not solve the general problem with red tape. Another positive development is the new MES strategy to improve the ecosystem for R&I and the corresponding upcoming changes in the law.

During our discussions in Georgia, local stakeholders shared their ideas for addressing the urgent issues around procurement. We have included these as Annex 3 to the report. EU support instruments, such as TAIEX missions and Twinning activities, should be applied for in order to receive support for improving the system, as well as advice and cooperation with EU countries which have experienced similar problems (e.g. Poland and Czech Republic).

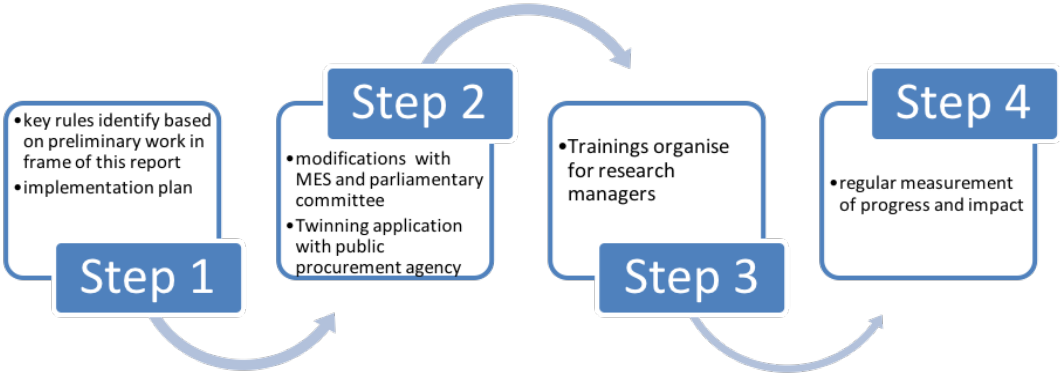
Addressing the problem of, and issues around, the high level of bureaucracy and administrative burden in the Georgian R&I system is important to **enable quick gains in terms of commitment, resources and economies of scale.**

Key operational steps:

- Identify the key rules and regulations that need to be simplified in the R&I system to reduce bureaucracy: in procurement, in SRNSFG rules, etc. (see Annex). Develop an implementation plan for the required modifications.
- In case of regulation and laws that need to be modified, initiate the necessary procedures with MES and the Parliamentary Committee for Education, Science and Culture.
- Apply for a Twinning action with the EU Delegation in Georgia, which will involve the Georgian public procurement agency and a counterpart organisation in an EU-15 member state.

- Organise trainings for university and institute administration on the relevant rules (in particular procurement) and simplifications undertaken.
- Evaluate and measure progress on reducing red tape.

Figure 4: Activity line for reducing bureaucracy in research and innovation



3 PRIORITISATION IN RESEARCH AND INNOVATION

Setting and implementing a small number of research priorities is of vital importance not only for the future of the Georgian R&I system but also for its future economic prosperity. Hence, it is not surprising that there have already been attempts at establishing research priorities, albeit not entirely successful. These attempts at prioritisation were to be carried out by the RIC. However, since this body has not functioned properly at strategic level, as discussed in section 2.5 of this report, it is not surprising that it has also largely failed to fulfil its responsibility in terms of prioritisation.

Currently, there are over 80 research priorities[33] (or de facto no prioritisation at all) in the Georgian science system. In light of limited budgets, and the overall size of the research system, this is obviously not sustainable. There is a need to **focus on a limited number of promising R&I fields** to be supported at a level that allows them to support local industry with research and to compete internationally. Our estimate is that the public purse of Georgia is unlikely to be able to sustain more than three or four priority areas[34].

There is also some evidence that some innovation priorities have been defined by GITA, e.g. ICT and biotechnology. Furthermore, thematic priorities were mentioned during our interviews in Georgia, e.g. biotech, health, agriculture, engineering, etc. Three issues worth mentioning here are: a) these priorities are, as a rule, not the result of a systematic process; b) priorities are not backed with dedicated resources; and c) there is little coordination between research, innovation and economic priorities.

Setting up, and maintaining, research priorities is not a trivial task and is problematic even in developed, and much wealthier, research systems. In the case of Georgia, it is even more problematic, "because the size of the research budget means that non-priority areas will be virtually abandoned" (Bregvadze et. al, 2014, p. 37)[35].

Furthermore, priority-setting attempts in Georgia are hindered by the lack of two essential preconditions for their success, namely clarity in terms of strategic, operational and executive responsibility in the STIS, and the availability of reliable data on research, innovation, and economic activity and developments.

[33] See Annex 1, Terms of Reference for the PSF Specific Support to Georgia.

[34] It is worth noting that supporting a limited number of high-priority areas does not mean that support for the rest of the research system can be abandoned. It is important to develop a hierarchy of priorities differentiated by the level to which these are supported.

[35] Bregvadze, Ta., Medjad, K. and Bregvadze Ti. (2014). Research performance in Georgia: analysis and recommendations.

3.1 Preconditions for successful prioritisation of research and innovation fields

For the purposes of this report, we focus on two preconditions for the success of any research prioritisation process, i. e. clarity in terms of strategic, operational and executive responsibility in the STIS, and the availability of reliable data on research, innovation, and economic activity and developments. These correspond to two overarching problems within Georgia's R&I system, as identified in section 2.6 of this report.

3.1.1 Clarity of strategic, operational and executive responsibility

Clarity of strategic, operational and executive responsibility embodied in different research policy bodies is **essential for the success of the prioritisation process** because of the necessarily hard decisions and negotiations of interest that need to be carried out. Moreover, strong strategic actors in the system ought to decide on a very limited number of priorities and should have the authority (influence) to translate these into coordinated operational policy actions.

Our investigation into the distribution of policy responsibilities in the Georgian STIS leads us to conclude that this is by no means straightforward or clear cut (see section 2.5.1 above). To recap, to the best of our knowledge, RIC – nominally the top-level strategic and coordination body in Georgia's STIS – has been unable to fulfil its core tasks. There were also indications that strategic-level decision-making has been somewhat supplanted by operational concerns at the highest policy levels within the system. There are no coordinating mechanisms at the operational, ministerial level which seeps into the executive agency level.

To remedy the main governance deficiencies discussed here, and to create the preconditions for the successful design and implementation of a R&I prioritisation process, we have made the following recommendation.

3.1.1.1 Recommendation 3: Restructure the RIC to become a functioning strategic actor in the Georgian STIS

First and foremost, we believe that the **membership of the RIC needs to be revisited** since its current membership is so wide that it prevents it from becoming a strategic decision-making body. It may be that membership ought to be downscaled to include only those ministers representing ministries immediately concerned with R&I (e.g. MES, MOESD, MDH and MOD), representatives of the universities and key players in the Georgian economy. This restructured RIC should be tasked with deciding on, and overseeing the country's R&I strategy and policy, including deciding on the long-term strategic R&I priorities (ideally aligned with the economic priorities), and on specific, country-wide, priority programmes to support these high-level strategic priorities. Political commitment and readiness will be required of the actors involved to restructure and make the RIC a truly strategic body.

Strengthen the operational level and ensure a necessary level of coordination: The operational level, or the ministerial level below the Minister, should be empowered to be able to deal with the operational issues around implementing the R&I strategy and strategic issues. This can be done within the current arrangement by changing the responsibilities of certain ministerial departments and department heads[36]. Targeted measures to ensure collaboration and coordination between relevant ministries should be implemented (specific arrangements depend on local culture and customs and are thus difficult to recommend).

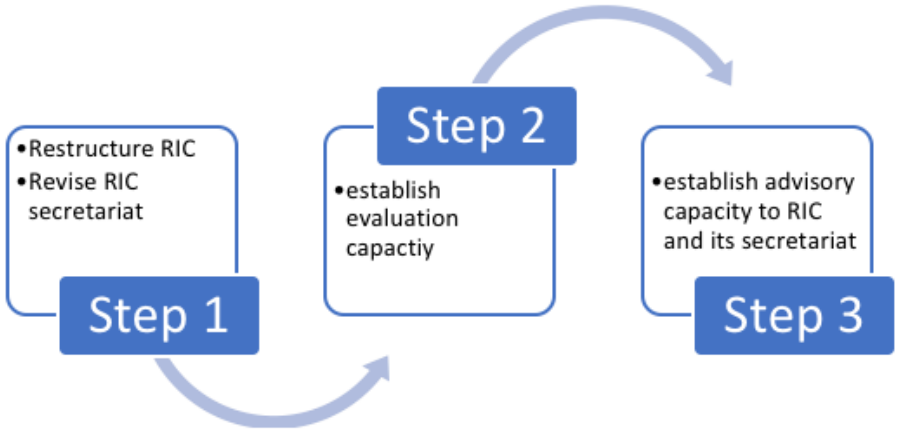
Develop advisory capacity: Within the RIC's operations and its secretariat it must be seen that in preparation for important decisions relevant stakeholders (such as researchers, business, NGOs) are consulted at the beginning and sufficiently involved in the decision preparation. Both the RIC and the operational body will need an advisory competence; as regards priority selection, this will usually involve a whole process with analysis, convening workshops, selection, and report drafting, which will require external expertise.

Key operational steps:

- Restructure the RIC, its membership and mandate. Redefine in a strategy document and/or legal basis the RIC's membership and tasks, focusing it on top-level decision-making for R&I policy – to deal with strategic issues.
- On a more regular basis, convene an operational interministerial/inter-agency subgroup to the RIC. This should be a revised form of the current arrangement, i.e. a revised secretariat to the RIC (composed of representatives of agencies and ministries – at the director level). This body should deal with day-to-day R&I policy decisions – operational issues.
- Ministries (e.g. MES and MOESD) will be responsible for convening the RIC.
- An evaluation capacity needs to be established with the SRNSFG, which will be dealing with the PRFS.
- An advisory competence will be required of the RIC and its operational body (RIC secretariat).

[36] Please note that experience elsewhere shows that tasking one ministry with operational responsibilities in the STIS usually leads to developing silos of R&I policy and exacerbates those coordination problems which already exist.

Figure 5: Activity line for clarifying authority structures



3.1.2 Availability of reliable data on research, innovation and the economy

Prioritisation demands the easy and transparent availability of data on different aspects of research, innovation and the economy. Our experience while compiling this report is that, although there were initial attempts to develop an information system, this is far from ready yet; furthermore, data are not readily available in Georgia.

According to the background report on the R&I system in Georgia[37], and in line with our observations and experience:

- Little or no data is available regarding the streams and amounts of R&I funding.
- There is no central database of researchers, research groups and research units.
- Patent data is limited (although there is some evidence that there are strong research fields in pharmaceuticals and organic fine chemistry).
- Bibliometric data, to the extent to which it is available, draws on international sources and thus excludes much local research. Also, it is not finely grained enough to account for different publication and citation patterns in different research fields, thereby making it impossible to compare the findings. Nevertheless, thematic comparative specialisation patterns could be detected in the subject areas of mathematics, physics and astronomy, earth and planetary sciences and multidisciplinary topics. Studies beyond bibliometrics were focused on applied fields and identified ICT, biotechnology and others (see chapter 5 on SBL).
- Data on competitively acquired projects, which may help to differentiate stronger areas from weaker ones, must rely on project participation in open programmes, such as the major SRNSFG schemes. Participation in FP7 and Horizon 2020 is still rather limited and thus probably hardly indicative.

[37] Schuch et al., (2017). Background report.

Participation in most other international programmes (other than FPs) is often thematically biased and thus cannot be taken as a reliable source for comparative cross-thematic analysis.

3.1.2.1 Recommendation 4: Initiate a dedicated, nationwide project on designing and implementing an information system for Georgia

A dedicated and professional unit should pioneer this project; it could either be part of a ministry or an agency working across existing organisations – ministries, R&I agencies and research-performing organisations. We will return to this recommendation in more detail in the chapter on PRSF.

Designing and maintaining this information system should also be aligned with information requirements from outside the country.

3.1.3 Overcome the fragmentation of the Georgian research system

Establishing and sustaining R&I priorities and the fragmentation of an R&I system is a complex relationship. On the one hand, overcoming the fragmentation is a clear precondition to (an initial step for) carrying out a successful prioritisation process. On the other, prioritisation can be one of the policy measures to overcome fragmentation of the system. In any case, the issue of fragmentation ought to be addressed.

As already discussed in sections 2.4 and 2.6 above, Georgia's R&I system appears to be very fragmented whereby **research units with similar remits are in different organisational silos**.

Apart from the usual issues associated with fragmentation, e.g. lack of coordination and opportunity costs, Georgia has a very specific problem: many research units are sub-critical because of the small number of researchers, ageing research staff, and inadequate and insufficient research facilities and equipment. Furthermore, interviews with researchers have shown that available research equipment is confined to those units which purchased them, and not shared with research groups working on similar issues or which could benefit from the equipment.

3.1.3.1 Recommendation 5: Establish a small number of national R&I centres

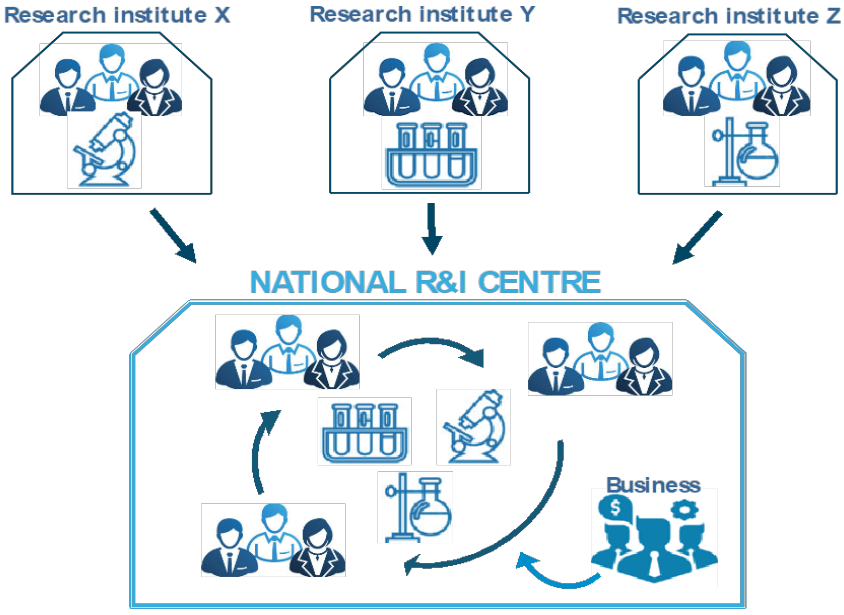
We recommend **three or four national R&I centres are established to integrate the otherwise fragmented organisational research units**. We believe this integration can be achieved, in the first instance, **around research equipment and facilities**. Later, **thematic and topic-based** synergies across closely related research could be expected to emerge.

We envisage these R&I centres as:

- organised around both existing and new research equipment and facilities (and provisions for maintenance of these facilities);

- relatively flexible structures that complement rather than displace existing organisational units;
- the R&I centres[38] should be excellence driven, as regards R&I, and access to them (participation) should be decided on a competitive basis;
- research groups and units involved with the R&I centres should be expected to align their collective research lines and, ultimately, some of these could be expected to establish joint research agendas;
- R&I projects carried out at these centres, or at least some of them, should be aligned with economic priorities. Thus, involvement of business interests, either as a sponsor, user or research partner, is highly desirable;
- physical integration of research units, we believe, would be easier to achieve and manage at this stage of development and maturity of the country's R&I system. It would gather researchers from different units around joint equipment in one place. And this kind of disruption of existing structures would lead more readily to building critical mass. However, flexible arrangements using virtual platforms are also a possibility;
- one way to implement creating R&I centres, which leaves the definition of the scientific field up to the scientific community, would be a call for R&I centres to be launched by SRNSFG.

Figure 6: R&I centre approach



[38] Please note that we see the R&I centres as different from the competence centres we suggest in the chapter on SBL. The latter should have a regional and stronger applied focus.

We would like to emphasise that we do not intend to propose new organisational forms, reproducing the structures of the former Academy of Sciences and competing with the existing ones. These R&I centres could be initiated as fluid platforms where research groups and labs that meet certain criteria have access to state-of-the-art research equipment and facilities, and use them over time to align their research agendas. We return to this matter later in this chapter.

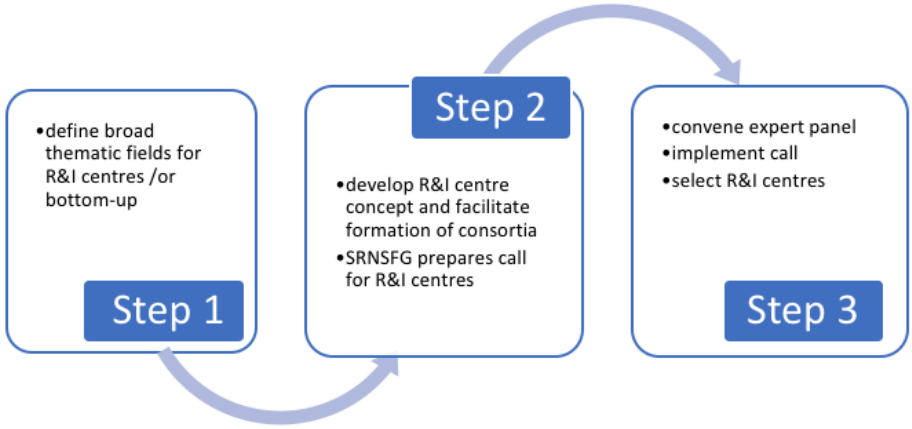
Finally, we would like to mention the following:

- Establishing national R&I centres is not only intended to avoid duplication and fragmentation in Georgia's R&I system. They can also address issues around units that have no **critical mass** (small number of researchers, ageing, etc.).
- The success of this measure is dependent on a process of **evaluating the research units**. Preferably this should be done using international experts in the relevant research fields.
- While the national R&I centres do not have to employ researchers, it is important to support several **technical staff** to maintain and service the research equipment and instrumentation.
- In the longer run, a condition for R&I centres will involve establishing an **inventory of Georgian research units and of available modern equipment**. This activity should be linked to preparing a database for the PRFS, and coordinated with the mapping of SBL success stories.
- Another condition concerns a decision on **base-line funding**, which should be linked to the R&I centre formation.
- These conditions should not hamper implementation of a **pilot competition for two R&I centres, to be implemented in a short-term perspective**.

Key operational steps:

- Define tentative broad thematic fields for R&I centres: health, ICT, energy, agriculture, biotech. Alternatively, a bottom-up approach may be used.
- Develop a conceptual framework and modify rules and regulations to enable the creation of R&I centres. Promote the concept and facilitate the formation of consortia for R&I centres (e.g. via information and matchmaking events).
- Draft the ToR for the competition, including the selection criteria for R&I centres that must be applied (see chapter on prioritisation below).
- SRNSFG should prepare a call for R&I centres, whereby a minimum number of research units (at least two), and an innovation unit (at least one business)/commitment from an innovation unit must come up with a proposal for an R&I centre. Definition of the thematic field for the new R&I centre remains with the proposers. Specify call budget and timeline.
- Convene an expert panel, including international experts to assess the applications for R&I centres, and those units which should be closed, reformed, redirected or merged.

Figure 7: Activity line for addressing the fragmented research system



International practice case: KNOW – Leading National Research Centre, Poland

During the reform of the Polish research and higher education system in 2011, the fragmentation of research centres was identified as one of the major systemic problems. For historical reasons, prominent scientists and the best laboratories were dispersed across different types of institutes (university faculties/institutes, industrial research institutes and the Polish Academy of Sciences institutes) and all over the country.

The KNOW Programme (acronym in Polish for 'Krajowe Naukowe Ośrodki Wiodące' – Leading National Research Centre) was introduced to address this challenge. Its aim was to reach a world-class level of research in leading Polish scientific disciplines, and in a limited number of virtual excellence centres. These centres had to be established on the basis of existing structures, and were stimulated to achieve physical and organisational concentration. A joint research agenda had to be presented, as well as measures for supporting young scientists.

Additional institutional funding was offered with up to PLN 50 million (about EUR 12 million) for five years. The grant could be used by KNOWs according to the same rules as performance-based institutional funding, and provided a significant financial top-up of this source of income. Calls were launched in 2012 and 2014, and applications reviewed with the involvement of international experts. Ten KNOW centres were selected in fields such as physics, chemistry, agriculture and life sciences. Only consortia of research institutions led by a university institute could apply. Different configurations of institutions were achieved in successful applications, e.g. a KNOW with three university institutes, an academy institute and a hospital was funded in life sciences.

In 2015, a mid-term evaluation of the programme indicated the programme's positive impact on research quality (measured with bibliometric tools), but limited impact on consolidation and integration. Final evaluation of the programme is planned following its completion in 2019.

3.2 Identifying and establishing research and innovation priorities

In this section of the report we set out the foundation for developing and implementing a process for the selection of R&I priorities in Georgia.

3.2.1 What priorities?

Our explorative interviews provide strong indication that currently in Georgia research policy, innovation policy and economic policy are being developed and implemented separately with little coordination between them.

3.2.1.1 Recommendation 6: Align priorities for research and innovation to strategic economic priorities

We believe that, considering the issues discussed above, it will be beneficial to either **develop a unified R&I policy or to try to align these two policies through developing coordination and funding mechanisms and frameworks**. Furthermore, the economic policy of the country should inform and focus decisions and efforts in both research and innovation.

Hence, we suggest that the Georgian authorities do not consider the country's research priorities as separate from its strategic economic priorities and innovation priorities. Priorities that cross research, innovation and the economy should be generated.

Furthermore, it is important in the long run to identify niches in the global market where Georgia can compete and to match these with demands for research excellence.

Key operational steps:

- Initiate a process for selecting R&I priorities, jointly managed by key actors from R&I (MES-MOESD, SRNSFG-GITA) and via the revamped RIC secretariat.

3.2.2 Criteria for identifying priorities

3.2.2.1 Recommendation 7: Develop consistent and transparent criteria for the selection of priority research and innovation fields/areas

Irrespective of whether the priorities are programmatic or strictly research-related, the following criteria for selection should be applied:

- Importance of area/field for the **future prosperity** of Georgia, for improved competitiveness based on innovation, and for the well-being of its citizens.
- Is there **business/industry** (or potential for developing industry) that supports this priority.
- Level of **excellence** of R&I field(s) as measured by traditional indicators and application.

- Quality of **infrastructure** (buildings, etc.), facilities and equipment and how expensive it will be to upgrade this to at least average international standards.
- Is there **critical mass** (in the context of Georgia) in the R&I field in terms of size, research capacity and sustainability.

These criteria can be worked into a scale that can be used to rank ideas for priorities and select the top ones. We can group them into the following categories:

(1) **academic criteria** (academic excellence, quality of infrastructure and facilities, and critical mass of research groups);

(2) **impact- and application-related criteria** (relationship with wealth creation and quality of life, and supporting economic/industrial sector).

These dimensions can be scored (using specific and transparent criteria). Selected priorities, in the first instance, should score highly on both academic, and impact and application criteria.

Table 4: Grid for priority selection

	Impact and application criteria (high)	**Impact and application criteria (low)**
Academic criteria (high)	Priority selection quadrant short and medium term (5 years and more)	Additional priorities for the long term (10-20 years)
Academic criteria (low)	Priority import knowledge (5 years)	Do not select

Key operational steps:

- Discuss the selection criteria in the operational body, the RIC secretariat, and have them formally approved by the RIC.

3.2.3 How to identify research priorities?

3.2.3.1 Recommendation 8: Apply reliable methodology for priority selection

Here we would suggest that one, or a combination of the following approaches may be helpful to ensure reliability, transparency and consensus in the prioritisation process.

One approach could be to identify research priorities through **a Foresight exercise**. Foresight is a systematic, participatory, future-intelligence-gathering and medium-to-long-term vision-building process aimed at present-day decisions and mobilising joint actions. R&I policies are based on (implicit or explicit) visions of the future of science, technology and society[39]. Foresight is a collection of tools that make it possible to prepare long-term development scenarios. The Foresight tool catalogue comprises methods based on expert knowledge, quantitative methods and methods specifying key action points. Primarily, the exercise will have to assess the potential of the research base and must include an element of international peer review. Issues of comparability need to be accounted for.

In a second step, the exercise would aim to achieve a level of consensus between different participants (stakeholders) in Georgia's R&I system. Because the country is small made up of different communities, if not systematic, the process can be exposed to suspicions of corruption.

Hence, we would propose using a light touch but robust form of Foresight to generate priority ideas that cross research, innovation and the economy. This can take the form of a series of structured workshops (e.g. with focus group methodology), for instance.

International practice case: National Foresight Programme Poland 2020[40]

The idea for the National Foresight Programme for Poland emerged in 2003 in the Ministry of Science and Information. It was included as one of the measures to foster innovativeness in the 'Plan for promoting growth in the years 2003-2004', adopted by the Council of Ministers. This resulted in a pilot Foresight programme which was carried out in the area of 'health and life' research in 2003.

The fully-fledged National Foresight Programme "Poland 2020" (NPF) was implemented in 2006 by a consortium comprising: the Institute of Fundamental Technological Research (consortium coordinator) and the Institute of Economics, both of the Polish Academy of Science, and Pentor Research International. The programme was coordinated by a steering committee set up by the Ministry of Science and Higher Education and the Ministry's Foresight Unit. The scope of the Foresight covered three research areas: sustainable development, ICT, and security. Twenty expert panels were convened to cover the thematic areas. The main objectives of the Foresight were:

[39] See For-learn foresight guide, with its extensive online information on Foresight and its methodologies: http://forlearn.jrc.ec.europa.eu/index.htm

[40] Sacio-Szymańska, A., Kuciński, J. (2007). National Foresight Programme "Poland 2020" Foresight Brief No. 121, The European Foresight Monitoring Network: http://www.foresight-platform.eu/wp-content/uploads/2011/02/EFMN-Brief-No.-121_Poland-2020_SocioTrans.pdf

Poland 2020. A Look from the Future. Alternative Visions of Poland's development, based on the National Foresight Programme Poland 2020 scenarios. Brochure on Polish Foresight results: https://www.nauka.gov.pl/g2/oryginal/2013_05/57618967bbf4f2a2fa716160a551b847.pdf

- specifying Poland's development vision up to 2020;

- building consensus among main stakeholders;

- defining priorities in the area of R&D;

- rendering expenditure of public funds more efficient;

- promoting Science for Economy;

- and creating a social dialogue and culture of thinking about the future.

From the many available methods to be applied in Foresight studies, the following were mainly used in the NPF case: expert panels, SWOT analysis, Delphi survey, PEST analysis, cross-impact analysis, and scenario development.

Besides the obvious results of the NPF, such as scenarios and lists of emerging technologies, equally important were the creation of a platform for discussion and cooperation between science, industry and public opinion on a range of scientific and technological priorities as well as the main social issues. Furthermore, it raised awareness of the debate on the future development of the country and helped to build trust among different stakeholders.

The National Foresight Programme has provided important input for strategic planning for R&I policies for the period 2007-2013 and beyond. It has also opened a series of more focused (topic-oriented) national and regional Foresights performed from 2007 until now.

A second approach could be to use **smart specialisation** (S3) for priority identification. We recommend first trying to use S3 and seeking support from the EU for it. Smart specialisation is a regional policy framework for innovation-driven growth. It helps focus resources on key national and regional priorities, challenges, and needs for knowledge-based development. S3 is a bottom-up process relying on an entrepreneurial discovery process (EDP), which involves various stakeholders such as businesses, private stakeholders and policymakers for capacity and priority identification. It is evidence-based and includes sound identification of priorities, monitoring and evaluation (RIS 3 guide, 2012; OECD, 2013)[41].

This approach has the advantage of being well established and supported within the EU, and the fact that it integrates R&I. In the EU, it has been used as a requirement for regions implementing Operational Programmes with the European Structural and Investment Funds (ESIF), and is acknowledged as a driver of innovation and regional economic transformation. S3 has triggered wider stakeholder involvement in R&I strategy development, led to closer links

[41] Foray, D., Goddard, J., Goenaga Beldarrain, X., Landabaso, M., McCann, P., Morgan, K., Nauwelaers, C., Ortega-Argilés, R. (2012). Guide to Research and Innovation Strategies for Smart Specialisation (RIS 3); http://s3platform.jrc.ec.europa.eu/documents/20182/84453/RIS3+Guide.pdf/
OECD (2013). Innovation-driven Growth in Regions: The Role of Smart Specialisation; https://www.oecd.org/innovation/inno/smart-specialisation.pdf

between business and research, and helped to leverage scientific knowledge with technological capacities and market opportunities[42].

Recently, several countries associated to the Horizon 2020, notably Moldova, Serbia and Ukraine, have entered smart specialisation processes with the support of the EU's Joint Research Centre (JRC). **Georgia should integrate into this process and seek support from the EU and the JRC for implementing the S3 exercise.** Our enquiries and those of the European Commission services (Directorate-General for R&I) have returned positive feedback from the JRC on implementing the S3 exercise with Georgia[43].

Contacts between the JRC and the Georgian authorities (ministry and GITA representatives) took place last year. According to preliminary information from the JRC, the smart specialisation process could start in autumn 2018. Several steps are required to initiate the process[44]:

- Georgia will have to formally express its interest in developing a smart specialisation strategy. The support is then given on the basis of a readiness assessment.
- A national team needs to be established, including ministries (MOESD, MES), the statistical office and other relevant stakeholders.
- A context analysis will be conducted to provide basic information concerning the administrative and political issues and the level of country/region development.
- An awareness-raising event (planned for Georgia in autumn 2018) and training on S3 will be carried out.
- An agreement will be concluded between the JRC and the Georgian authorities, including a roadmap, mutual obligations and criteria for common work and assessment of the final S3 document.

Several challenges were identified for S3 implementation in EU Enlargement and Neighbourhood countries in a recent study on the S3 potential in this region (Radosevic et al., 2017)[45] which should be considered when preparing the exercise:

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[42] Radosevic, S., Spiesberger, M., Stanionyte, L., Gnamus, A., Yegorov, I., Josimovski, S. (2017). The Role of Smart Specialisation in the EU Enlargement and Neighbourhood Policies, Danube-INCO.NET Deliverable 5.29, https://www.zsi.at/object/publication/4517/attach/D5_29_S3_role_in_the_EU_EN_policies-FINAL.pdf

[43] The expert panel and the European Commission PSF/DG R&I contacted the JRC in May 2018, as to whether it will be feasible to integrate Georgia into this S3 process.

[44] JRC, Smart specialisation (S3) framework in Enlargement and Neighbourhood countries; available from the JRC.

[45] Radosevic et al., (2017).

- **Analysis** will require reliable statistics on business R&D and innovation; it is frequently R&D focused, and does not sufficiently reflect industrial strengths and the entrepreneurial environment.
- In **governance,** coordinating bodies are lacking to facilitate interaction between different institutions and organisations, involving public actors, research, the business sector and NGOs.
- **R&I strategy visions** are often confined to research and technological development, failing to recognise and consider broad-based innovation, which embraces the whole innovation system and its participants, and may include various forms of innovation, such as policy, social, institutional, structural and innovations in services.
- **R&I priorities** identified are not the consequence of systematic consultation with stakeholders or of an 'entrepreneurial discovery process'.
- **Policy mix:** low availability of public funding for R&I, unfavourable framework conditions and weak governance hamper the implementation of policy strategies. Existing R&I funding is often distributed to research institutes and their programmes, while universities and business receive only a limited proportion of the funding.
- **Monitoring and evaluation** are important components of S3, but these features are still weakly established in these countries. Monitoring and evaluation will need to be strengthened.

Both approaches, Foresight and S3, are based on strong involvement from broad stakeholder groups, including policymakers, research, business and NGOs.

Key operational steps:

- Prepare and send a formal request to join the S3 process, which JRC has initiated for EU Enlargement and Neighbourhood countries associated to H2020 (MD, RS, UA). Conclude an agreement with the JRC on the S3 process implementation.
- Identify responsible contacts in Georgia and establish a national team for the S3 exercise. Communicate with the JRC.
- Organise an awareness-raising event in cooperation with the JRC. The event will be held in Georgia.
- Assess the possibilities of implementing a Foresight exercise; specify its objectives and take steps to secure expert assistance.

3.2.4 Who decides on research and innovation priorities?

3.2.4.1 Recommendation 9: Design a meaningful and transparent priority decision-making process, including a broad stakeholder consultation.

According to the current legislation, it is the RIC that decides on the research priorities. The GNAS acts as an advisory body to the government on priorities.

This arrangement should be reconsidered to take into account the integration or close alignment of R&I policies we have promoted and recommend. It is highly likely that the changed process for priority setting no longer includes GNAS in a formal and official advisory role; we believe that this organisation should take an active part in a wide stakeholder consultation process around prioritisation (or even be assigned responsibilities for organising it).

The practical management of the prioritisation process can be positioned within an existing R&I agency, or distributed across the agencies – we favour the latter option to take account of the combined focus on R&I. The key issue here is that actors, in both research and innovation, are involved, communicate and cooperate with each other. Since the priorities ought to bring together research, innovation and the economy, they will have to be agreed and decided by the **restructured RIC**.

Key operational steps:

- MES and MOESD should take the lead on managing the priority selection process.
- A consultation process among stakeholders needs to precede the decision-making.
- The revamped RIC should then decide on the priorities.

3.2.5 How to implement the research priorities

3.2.5.1 Recommendation 10: Implement priorities through funding and positive incentives.

Funding

Identifying and deciding on R&I priorities has strategic and operational implications for organising their financing in Georgia.

Here are the important choices in terms of R&I funding that would need to be addressed:

- Concentrate a proportion of the competitive, project-based funding for R&I by deciding on a **small number of priority programmes** aligned with considerations for wealth creation and quality of life. For example, we can envisage the initiation of country-level priority programmes, such as 'energy for Georgia', 'food safety and standards', 'health and well-being', etc.
- These programmes ought to be implemented at higher operational levels, e.g. coordinated ministerial action (see section 3.1.1 of this report) and managed by a cross-cutting programme committee.
- System-wide priority programmes could either be managed through a ministerial coordinating committee or, and this is the option we prefer, by a dedicated research funding agency tasked with implementing the priorities

decided at the system's strategic level. Although a viable option, creating a completely new agency may be rather cumbersome in the first instance. Thus, we would **suggest that these programmes are managed jointly by parts of the SRNSFG and GITA**.

- Use expertise and expert support to implement priorities. Implementing R&I priorities through research funding instruments requires considerable expertise. In the early stages of the process, this expertise may be mobilised from outside the country, with the long-term goal of growing local expertise and experience.

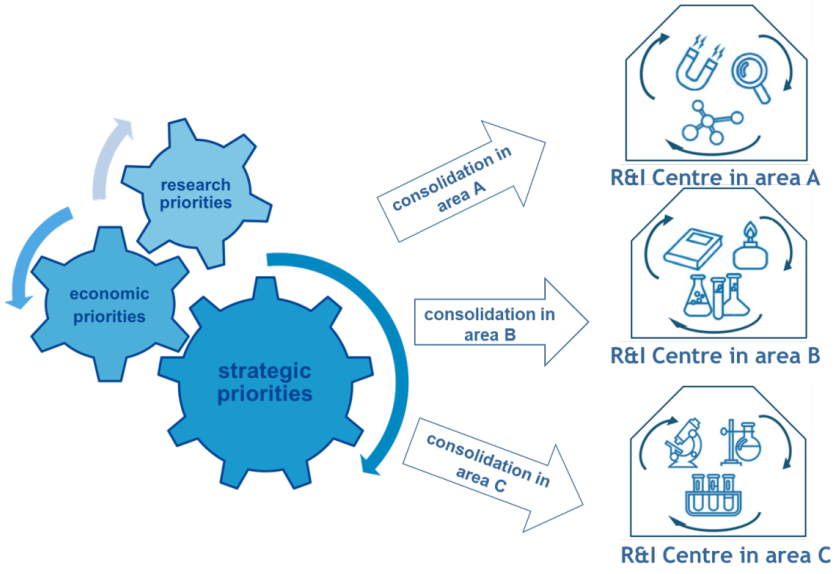
Positive structural incentives

Another approach to implementing R&I priorities – one that complements rather than substitutes the redirection of funding streams – would involve a set of positive structural incentives. Productive R&I systems thrive not simply, and solely, on funding but they also demand equipment and instrumentation, intellectually exciting research agenda, intellectually vibrant research labs, etc.

We believe that the establishment of national R&I centres provides the Occam's razor in this respect (see section 3.1.3 of this report). These **centres could be a solution to a number of issues in the context of R&I priority setting**; e.g. shared use of equipment, horizontal coordination, increased research and administrative efficiency, etc.

Initially, up to four national R&I centres could be set up to match the priority areas that have been agreed, and decided upon, and align with broader national interests. Once the R&I system in Georgia has developed further, and more resources flow through it, a second wave of these centres could be supported through bottom-up proposals specified, and managed, by SNRSFG and/or GITA.

Figure 8: National R&I centre approach

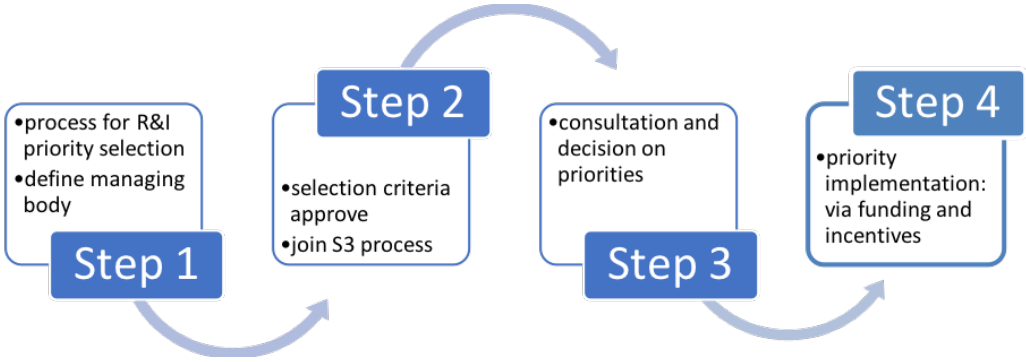


Monitoring and evaluation of priorities and related implementation programmes will be necessary, as well as feedback loops and programme adaptations.

Key operational steps:

- Implement priorities identified in S3 process via funding and positive incentives. Link budget to priorities – this must be decided by the RIC.
- Cross-reference to PRFS: base-line funding should be linked to priorities, especially R&I centres: selective and competitive – both can be aligned to priorities.
- Decide on the proportion of the budget for science and innovation to be channelled to priority areas (RIC secretariat). On this basis, programme design must be done by the agencies (SRNSFG and GITA) in cooperation with ministries and the RIC secretariat.
- Ensure that non-priority R&I fields are maintained to an adequate level to allow for a level of flexibility in the research system, and maintain and improve the education system.

Figure 9: Activity line for prioritisation



4 PERFORMANCE-BASED RESEARCH FUNDING

Performance-based research funding systems (PRFS) are usually developed for the allocation of base-line funding for R&I to public research organisations (e.g. universities and research institutes). Before we continue by discussing issues associated with developing and implementing a PRFS, and setting out our proposals, it is necessary to discuss the broad preconditions for PRFS in Georgia.

4.1 Preconditions for implementing a Performance Based Research Funding System in Georgia

In brief, designing and introducing a PRFS is ideally done in an environment where some basic conditions for conducting research are met. In the case of Georgia, we assume these basic conditions are: a) introduce base-line research funding; b) integrate the former research institutes of the Academy of Sciences fully in the universities; and c) upgrade the research equipment and facilities. We are aware that some of these conditions can be solved in the shorter term, while others (e.g. equipment) will require a long-term effort. Solutions to these conditions must be tackled, but they should not prevent gradually introducing and running a PRFS.

4.1.1 Introduce base-line funding for research organisations

We have already identified the de facto lack of base-line funding for research organisations (universities) in Georgia as one of the overarching problems of its STIS (see section 2.4 above).

Generally, experience elsewhere is evidence that the lack of base-line funding for research adversely affects research systems in the long run. This is because **base-line funding creates a necessary level of stability in the research system without which researchers are not able to pursue productive research lines**. When base-line funding for research is very low, or de facto non-existent, researchers and research groups start applying for project-based funding, and publishing, opportunistically.

In terms of introducing a PRFS, base-line research funding has a dual role: on the one hand, it is a major precondition to performance and, on the other, it is the lever for controlling research performance[46].

While the Georgian authorities allocate funds directly to research organisations (former institutes of the Academy of Sciences and institutes subordinated to ministries) this does not meet the definition of base-line funding since it only covers researchers' salaries at a very basic level. Furthermore, this funding from MES to organisations is only allocated to research institutes and not to research

[46] In many cases, the performance assessment originating in evaluation systems is used to determine the level of base-line funding to organisations for a certain period – usually five to seven years.

labs established by universities. Our interviews indicate that this practice of differentiation creates 'bad blood' and political tensions between different research-performing actors[47].

We propose the following policy measures to address this situation and create preconditions for the successful and meaningful introduction of a PRFS in Georgia.

4.1.1.1 Recommendation 11: Introduce base-line funding to public research organisations and create a level playing field

The proportion of public funding allocated to research organisations – **base-line funding – should be increased to extend beyond covering only low-level salaries and very basic expenditure** (e.g. electricity, heating, etc.). Experience gained elsewhere does not allow us to make a recommendation for a specific ratio of base-line to project-based competitive funding. In well-established and successful R&I systems, the proportion of base-line funding ranges from 70 % to 40-45 % of the total funding for research. Georgia currently has a share of about 50 % institutional and 50 % competitive public R&D funding[48]. The **competitive share**, which is allocated primarily via SRNSFG, has **increased in recent years. This has been a positive development as it has enabled the allocation of resources based on transparent criteria and peer evaluation.** It has provided a way out of institutional funding, which has been perpetuated in previous years and which has been (and still is) allocated without an assessment of performance.

It is worth noting, however, that two of the most successful R&I systems – those of Switzerland and Israel – are characterised by a high proportion of base-line funding (70 % and over) and a relatively low level of prioritisation[49].

All public research organisations should have access to base-line funding so as to create a level playing field among them.

Key operational steps:

- Assess the current share of public institutional versus competitive R&I funding, and whether it is still appropriate.
- Revisit the rules for access to public funding and bring these into line with the demands of a 'level playing field'.

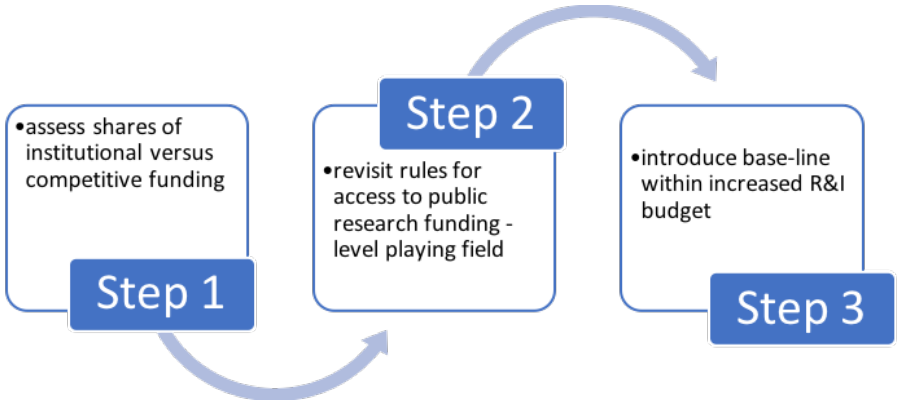
[47] The other side of this differential treatment of organisations and their staff in Georgia is that researchers in the institutes are not allowed to teach and perform other duties of university employees.

[48] Schuch et al., (2017). Background report.

[49] This approach may not be appropriate for Georgia at this stage since Switzerland and Israel also have a high level of research funding (in the region of 3 % or more). However, it is important to keep this point in mind.

- Explore possibilities to introduce base-line funding for research within an increased R&I budget.

Figure 10: Activity line for base-line funding



4.1.2 Complete the integration of research institutes and the universities

The reform of the Georgian National Academy of Sciences, its research institutes, and of the institute sector overall has yet to be completed. The integration of RIs into universities that was initiated in 2011 has remained largely formal[50]. Scientific personnel in research institutes are somewhat isolated from educational processes in higher education institutions. In order to enhance the integration of research and teaching, amendments were introduced into the law on higher education back in 2015[51]. But these amendments have still not solved the issue.

This **separation hampers the performance of both the RIs and the universities** (higher education institutions – HEIs). For the research institutes, it limits the necessary stream of young talent to be educated and trained. And for the HEIs, it limits the educational quality, as it misses out on the scientific competence of the RI collaborators.

4.1.2.1 Recommendation 12: Fully integrate Research Institutes into the universities

The full integration of RIs into the universities must be ensured, with possibilities for RI staff in research and teaching activities. Staff should be paid for education and research activities, and payment should be made according to the same rules. To this end, base-line funding is required.

We refer with full integration to those RIs, which have already been merged into universities in the reform 2011. We do not mean those research institutes operating as Public Research Organisations outside the universities, such as the

[50] This fact has been highlighted by the MES in the recent S&T strategy (2017).

[51] MES (2017), S&T strategy.

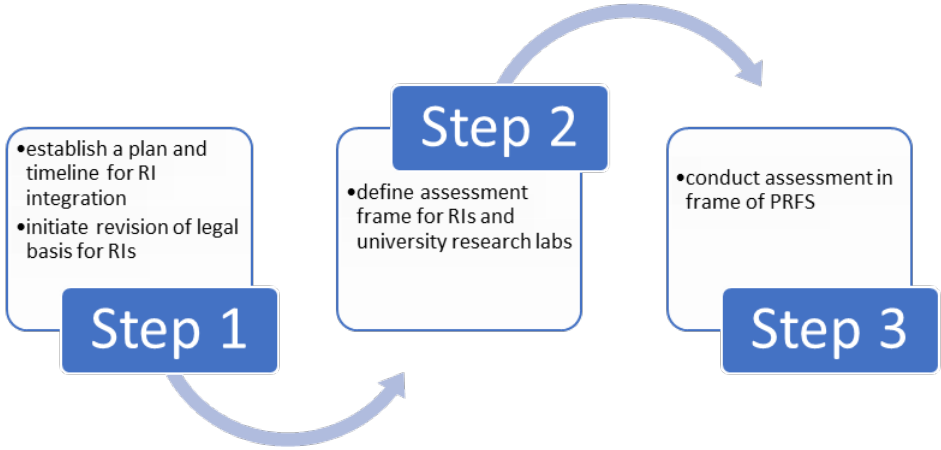
Eliava institute. There are good reasons for continuing such kind of solid Public Research Organisations outside the universities.

We recommend assessing the RIs to enable streamlining and integration in universities. A proper assessment of the GNAS' RIs should already have been done at point of transfer to the universities. Such an assessment has still not been done, but it would create a basis for and facilitate the streamlining and merging of institutes in HEIs, and the formation of R&I centres.

Key operational steps:

- Establish a plan, including a timeline for full integration of RIs in the HEIs; define exactly which steps need to be addressed to achieve this integration, and assess the 2015 amendments and why they were not effective.
- Initiate a process to revise the legal basis for RIs, to ensure full integration in the HEI sector, for example: base-line funding open to all public research organisations, change of employment contracts – all RI staff should be given the same contract as university staff, and they would have to become university employees (this should enable staff to teach and perform research), and develop a transparent work-allocation model.
- Define an assessment frame for RIs and university research labs.
- Conduct an assessment of the RIs and university research labs in the framework of introducing PRFS.

Figure 11: Activity line for full integration of RIs into HEIs



4.1.3 Upgrade research infrastructure and facilities

Upgrading the research infrastructure and facilities in Georgia's R&I system is of the utmost importance. Our rationale for emphasising it as a precondition for introducing a PRFS is that **modern science**, irrespective of whether it is expected to deliver excellence or to be an effective conduit for wealth creation and quality of life, **needs facilities and instrumentation.** It also requires flexible arrangements for access to these facilities and equipment (for sharing options,

see section 3.1.3.1 national R&I centres). Without equipment and facilities, and no flexibility of access, scientists are likely to choose to work on abstract topics with little relevance to society, the economy or even the international bodies of knowledge in the relevant research fields.

Working out specific sharing arrangements is context specific and we do not believe that we have sufficient cultural awareness to be specific. Our discussions with local actors in the R&I system showed a level of maturity that brings confidence in the local capacity to set up such arrangements.

We are also aware that state-of-the-art research instrumentation is expensive, and that renewing the equipment base in Georgia is likely to take time (or be somewhat delayed). Nevertheless, we consider this to be a sufficiently important issue to raise and thus to propose the organisational steps for it to occur

4.1.3.1 Recommendation 13: Upgrade the research infrastructure

The equipment and facilities in priority areas must be upgraded to at least medium international standard. This **upgrading must be linked to the prioritisation of R&I fields and to the establishment of national R&I centres.** The Ministry of Education and Science and the agencies (SRNSFG and GITA) should gather needs and requirements for equipment upgrade or purchase in the priority fields identified, which should then inform and lead to an equipment investment plan.

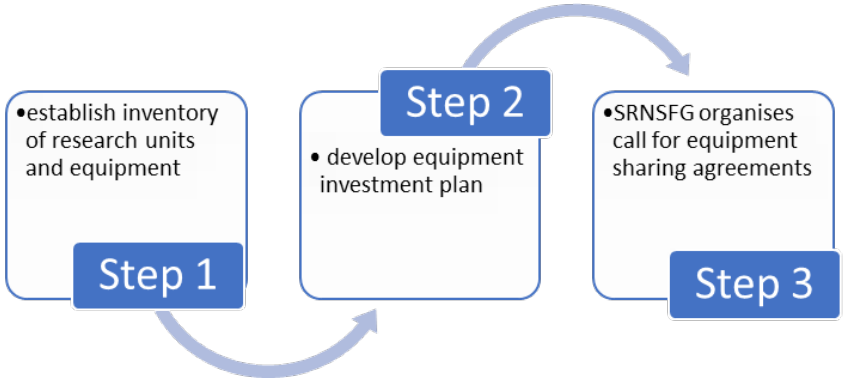
Research equipment and facilities should be concentrated, and at least for the foreseeable future, equipment-sharing arrangements across research groups must be worked out. These arrangements will need to be stimulated by a certain incentive mechanism, e.g. a call by SRNSFG, which will provide resources for service staff against equipment-sharing arrangements.

We urge the Georgian authorities to think creatively about addressing the research equipment and facilities and to consider possibilities and opportunities for private funding to purchase instrumentation.

Key operational steps:

- Establish an inventory of available cutting-edge R&I equipment in the country. This should be done by the SRNSFG and linked to similar activities for R&I centres (Recommendation 4).
- Develop an equipment investment plan.
- Organise a call for equipment-sharing agreements (for institutions outside the national R&I centres which will be established).

Figure 12: Activity line for upgrading research infrastructure



4.2 Performance-Based Research Funding System in Georgia: state of play

Provisions for the **evaluation of research performance** are at the core of any PRFS. Currently, the Georgian Academy of Sciences (GNAS) carries out research evaluation as a broad-brush reporting exercise. From our meetings with stakeholders, we have learned that these GNAS reporting requirements are substantial and amount to 200-page reports. GNAS experts then assess the reports, but usually do not provide feedback. Some researchers also mentioned that they doubt if these reports are read or assessed in any systematic way.

We also collected evidence that this evaluation procedure has very little influence over, or effect on the research system and research performance beyond keeping GNAS members informed about developments in the respective research units. Given the structural position of the GNAS – a reputational and advisory position – and the de facto lack of base-line funding for research organisations, this is not surprising.

Alternative approaches have been considered previously and a study was undertaken in 2014 on prioritisation and research performance assessment (Bregvadze et al.) and different policy measures discussed[52]. This project, which was financed by the United States Agency for International Development (USAID), should help the MES to identify stronger and weaker thematic research areas in Georgia. The authors concluded that, in order to provide a thorough assessment, a sophisticated, multi-layered framework involving a peer-review process which goes beyond conference proceedings and scientific articles, should be put in place. Special attention should be devoted to the transparency and legitimacy of the assessment process, which would require the inclusion of a significant and visible pool of international experts as well as more monitoring by more stakeholders. For the short-term, they suggested a three layer-system,

[52] Bregvadze et al., (2014). Research performance in Georgia.

comprising a block grant (which should be fixed and input-based and transformed in the medium term into a contractual output-based system), a second layer of competitive and contractual priority grants (for the priority areas identified) and a competitively awarded third layer of excellence grants.

During our first mission, we found out there are **shoots of good practice in performance-based research funding**. Thus, we were told that in some Georgian universities, research labs report to the university's academic council on real output: publications, patents, conferences, innovations, etc. Taking these reports into account, the university's research board and academic council allocate internal research funds.

While offering the promise of some experience, these evaluations of performance and funding are limited in three ways. First, these practices are localised within a very small number of established universities (Ilia State University is the most advanced). Second, these practices are applied only to the traditional university labs and do not include the former GNAS research institutes. And third, the funding distributed using these evaluations is necessarily negligible given the limited budgets of the universities.

While much of the discussion about PRFS focuses on the assessment processes, different **funding formulae** provide incentives for different kinds of behaviour. The use of skewed formulae – where the best performers are rewarded disproportionately – is a way of concentrating resources on 'excellence'. Overhead and infrastructure costs vary among fields. Consideration should be given to weighting the formula in order to take this into account (Debackere et al., 2017).

Small countries face particular PRFS design issues which must be taken into account: the costs associated with small scale; the limited number of fields that can be addressed in peer-review systems, as a result of which the few fields defined have to be broader than in large systems; the need to use foreign peers; the constraints of 'small' languages on peer recruitment and the corresponding need for a current quality-assured national research information system (CRIS); and national capacity to run a research assessment exercise (Debackere et al., 2017).

International good practice is available (e.g. in the framework of PSF), and PRFS managing staff should study and be aware of the state of the art before a Georgian version of PRFS is established. Once a system has been set up, it is difficult to modify it again. Few comparative studies have been conducted for EU countries: Jonkers/Zacharewicz, 2015 and Debackere et al., 2017[53].

[53] Jonkers, K., Zacharewicz, T., (2015). Performance-based funding: a comparative assessment: http://publications.jrc.ec.europa.eu/repository/bitstream/JRC97684/jrc97684_pbf%20final%20.pdf

Debackere, K., Arnold, E., Sivertsen, G., Spaapen, J., Sturn, D., Mahieu, B. (2017). Performance-Based Funding of University Research. Mutual Learning Exercise (MLE) on Performance-based Research Funding Systems (PRFS), forthcoming. For more information

4.3 Performance-Based Research Funding System managing body/ies

4.3.1.1 Recommendation 14: Allocate responsibilities for managing PRFS

We consider the Academy of Science is not the appropriate body to evaluate/assess the performance of research units. In light of this, the **reporting requirements to GNAS should be stopped without further delay.** There appears to be consensus in Georgia, and we concur, that the role of GNAS should be firmly as a high-level reputational academic body but it should not be involved in any significant way in the management of the PRFS.

Management of the PRFS can be done either directly by the Ministry of Education and Science, delegated to an agency or be carried out in a mixed approach, whereby certain tasks are outsourced. A decision on the approach to PRFS management will need to be taken by MES and the RIC, and the responsibilities clearly allocated among the actors involved. Of the existing executive agencies in Georgia, we have identified the SRNSFG as the most appropriate to either support the MES with certain tasks in the PRFS or to manage the whole performance evaluation of public research organisations. To this effect, it would be necessary to establish and develop another part of the SRNSFG (e.g. a PRFS department) which is aligned with but different from the part engaged in allocating research grants.

We also believe that all arrangements regarding the design and implementation of a PRFS in Georgia ought to be elaborated, discussed and agreed at the operational policy level, and be approved by the (restructured) RIC.

Key operational steps:

- MES and RIC to decide on the allocation of responsibilities for the management of the PRFS. In case SRNSFG supports the MES with the PRFS, or if the agency takes over the entire PRFS management, a specific department in the SRNSFG needs to be established for the PRFS. Ensure the availability of qualified staff for the PRSF tasks.
- Use the EU's Twinning and TAIEX support instruments for training missions on the PRFS to one or more EU country agencies or to countries associated to H2020 (e.g. Norway, Poland, Germany, Italy,)[54]. Bilateral funding opportunities from EU countries could also be used for this purpose.
- Develop the PRFS concept with clear regulations and duties, and approve it.

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see: https://rio.jrc.ec.europa.eu/en/policy-support-facility/mle-performance-based-funding-systems

[54] We suggest studying the Norwegian system, in particular, as it is transparent, simple and includes a model for a database.

4.4 Research and innovation system database

4.4.1.1 Recommendation 15: Establish an R&I system database

Georgia needs an R&I system **database, including information about researchers, affiliation, current research projects and findings, and output** (this system can also become the basis for working out equipment-sharing arrangements, etc.). This is a precondition for gathering sufficient information for measuring the performance of research entities. The willingness among researchers to provide data is a given, but in exchange the requirement to provide reporting to GNAS should be abolished. The data requirements will depend on the indicators chosen for performance assessment. The requirements for data provision should be kept to the necessary minimum and should not constitute a significant workload for researchers. Data requirements must be explained per indicator and must be formulated precisely to avoid misunderstandings when data is collected. Incentives should be considered to ensure the database is filled, e.g. allocation of public funding only if data are/have been provided. A quality-assurance loop must be foreseen to ensure that data are correct and plausible. This task has to be done by the PRSF managing body. International practice cases of such databases are available, e.g. in Norway the CRISTIN system (Current Research Information System in Norway)[55].

Evidence-based policy and a related database have been taken up by local stakeholders as important elements, and an ERASMUS+ project for establishing such a database has been submitted. The project proposal involves the MES with the quality assurance centre, Tbilisi State University (TSU) and 12 other public HEIs. The project, if funded, can serve to establish the database[56]. A **hosting organisation for the database** must be defined. We suggest allocating this function to the SRNSFG as it has already started efforts to collect data among researchers on performance, including publications and projects. Other actors are also collecting data, e.g. on Georgian researchers working abroad. In this report, we also suggest several data-collection exercises to get a clearer picture of the STIS, its capacities and links to business. These concern research infrastructure, success cases of science business links and technology transfer support. These efforts for data collection need to be coordinated and ideally cross-linked or integrated.

Key operational steps:

- Establish a Georgian R&I systems database, building on and coordinated with already ongoing efforts within the SRNSFG and the ERASMUS+ project for establishing such a database (in case of project funding).
- The database and data collection should be coordinated and/or integrated with other ongoing data-collection efforts and those suggested in this report (see,

[55] See http://www.cristin.no/english/

[56] At the time of writing the report in spring 2018, the ERASMUS+ project proposal was still under evaluation.

for example, Recommendation 6 on establishing an information system, and in the SBL chapter).

- Define categories for data input which will be required in the database – based on indicators for impact evaluation.
- Define a hosting organisation for the database, preferably the SRNSFG.
- Introduce an obligation for research institutions to fill in the data for the database – according to the principle of 'no data, no money'. Foresee the quality assurance of data by the PRFS managing agency (e.g. by a SRNSFG department to deal with the PRFS).
- Sanctions will be required on providing false data, especially on science-business cooperation. For example, no points in the evaluation system will be allocated if no evidence has been provided.

4.5 Methods and indicators for performance measurement

4.5.1.1 Recommendation 16: In terms of methodology, combine metrics and peer review for performance measurement.

Today, the use of a combination of metrics and peer review[57] has become more common in the PRFS, although most rely on metrics for cost reasons.

Metrics capture, via Knowledge and Performance Indicators (KPIs), the performance of research actors at different levels. They can be categorised in short-term output and longer-term impact dimensions. For example:

- **Scientific dimension** can be measured via publications and bibliometric analysis, national projects and budgets acquired.
- **Economic dimension** can be measured via contracts with business and related income.
- **Societal dimension** can be measured via dissemination and communication to policymakers and the general public, innovations generated with impact on society (addressing societal challenges faced by Georgia).
- **Collaboration dimension** can be measured via international grants acquired, their budgets, and scientific prizes awarded.
- **Education for research dimension** can be measured via PhD students educated and their career path.

Because of their unobtrusive nature, metrics can be used as part of an ongoing process of research evaluation.

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[57] Debackere et al., (2017).

Arnold, E., Farla, K., Kolarz, P., Mahieu, B. and Peter, V. (2014). The Role of Metrics in Performance-based Research Funding systems. A report to the Russell Group. Technopolis.

At certain time intervals, **peer-review panels, including a substantial number of foreign experts and emigrated Georgian scientists**, should be called in to assess the performance of research units in Georgia. The inclusion of foreign experts will help to tackle the problem of closed clubs – the evaluation and decision-making in small R&I communities among the same actors. Peer review allows qualitative information to be gathered on performance, and to provide feedback and advice to the universities.

The performance measurement should start at individual researcher and/or research group level, and can be aggregated to research institutes and institutions.

Key operational steps:

- Include in the conceptual document on the PRFS a methodological chapter foreseeing a combination of metrics and peer review for measurement.
- Elaborate and agree on an indicator set for measuring performance of public research institutions. A TAIEX or Twinning project could be used to specify the exact set of indicators.

4.6 Implementation of Performance-Based Research Funding System

In the first sections on the PRFS, we have outlined three preconditions for introducing it:

- introducing base-line funding;
- full integration of RIs in universities;
- upgrade of research infrastructure.

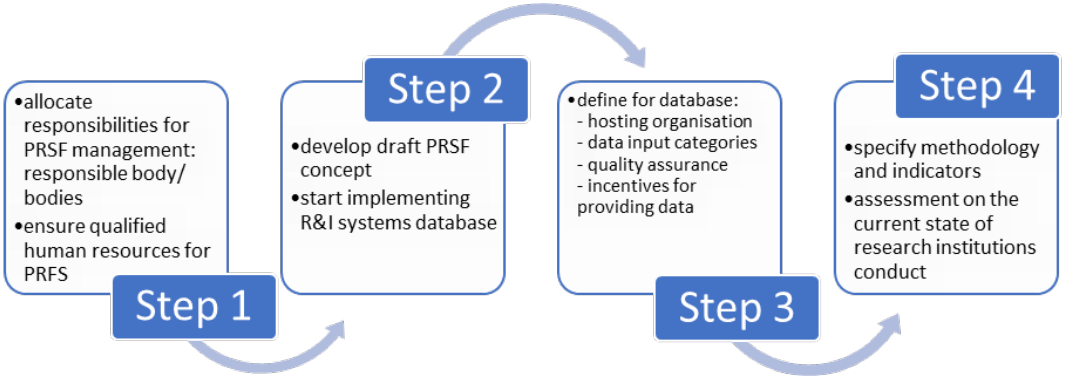
We have provided key operational steps and activity lines for the implementation above. These **preconditions should not be seen as an obstacle to beginning a gradual introduction of the PRFS**. We are aware that significant funding increases for base-line and investment in research infrastructure will be long-term efforts. However, other preconditions, the full integration of the RIs in the universities, opening base-line funding to all public research organisations, and the overall problem of red tape in research should be tackled immediately. These measures will allow the research organisations to increase their performance and bring them on to a level playing field.

In other sections above, we have put forward the practical steps required to move towards the PRFS:

- deciding on a PRFS managing body/bodies;
- establishing an R&I database;
- defining methods and indicators for measurement

The following activity line summarises the key operational steps towards these measures:

Figure 13: Activity line for implementation of PRSF



Beyond these immediate actions, several points must be taken into consideration when designing and starting to implement the PRFS, over a longer period:

We suggest the **gradual introduction of the PRFS**. It should not be delayed for too long to avoid the continuation of spreading resources over research institutions, for which the output and impact is not clear and for which de facto no evaluation has been done yet. In particular, at the point of integrating the research institutes into the universities, a proper assessment should have been conducted. This should be done during the early phase of PRFS introduction.

The current **state and capacities of the research institutes and research labs should be assessed** to get an overview of the available research capacities in the country. A light touch should be used to make some progress in the short term, e.g. a short self-evaluation report and basic data for the most recent two to three years (maximum five pages per RI and research lab). These should be assessed by the PRSF department, and then by a mixed expert group involving Georgian and foreign experts. The results should feed into further planning for the PRSF.

As the PRFS is a policy instrument, the **policy goals** for introducing it need to be clearly identified by the Ministry of Education and Science. These goals should then be reflected in the shape and elements of the PRFS to be introduced.

A **balanced set of indicators** will be required in the Georgian case. In several countries as well as in the limited Georgian assessment exercises, publication indicators and bibliometrics play a major role. While they are important, over-reliance on these excellence indicators should be avoided. We have outlined the problems with publications above in chapter 3.1.2 Availability of reliable data on research, innovation and the economy. The other dimensions (societal, economic, collaboration and education) and related indicators (e.g. reflecting applied research and innovation activities via indicator contract research) need to be considered as well and a balanced approach found.

The indicator set will provide input for a PRFS funding formulae. This **funding formulae** must be developed for allocating the base-line funding or, as in most cases, a share of it on a performance basis. Here, countries use different approaches – we refer to the PSF Mutual Learning Exercise on PRFS (Debackere et al., 2017) for experience in EU countries. The exact formulae should be developed in an internal process in Georgia; the panel is not going into further detail here.

The **share of base-line funding, which should be allocated on a performance basis**, also needs to be defined. Countries use different shares of base-line for competitive allocation, starting from 5 % of base-line funding up to 100 %. In the case of Georgia, we suggest not going for the lowest level. As only limited base-line funding is allocated in Georgia, a minor share of it to be allocated competitively will not achieve a big impact and the effort will not be in relation to the funds allocated.

Peer review should complement the data-based metric measurement of performance. In small countries, conflicts of interest can easily appear in peer review; thus, it is preferable to use international experts on peer-review panels. Georgian researchers who have emigrated are an interesting group to be included in peer review as they have experience in both their home country and the R&I systems of foreign countries. As we suggest using a balanced set of indicators, the panels should comprise experts reflecting not only the public research sector, but also other parts of society.

5 STRENGTHENING SCIENCE-BUSINESS LINKS[58]

This chapter on strengthening science-business links (SBL) opens with an overview of local conditions for this interaction, challenges posed currently and the available stimulation measures. Thus, we have structured it into three main aspects of SBL, which has been reflected in subchapters: transfer of knowledge (brokers, researchers and intellectual property – IP), co-production and co-funding (collaborative research, tax incentives), and exchange of people (mobility schemes, undergraduate students and PhDs funded by industry, dual affiliations). Recommendations are provided for each of these issues. We conclude this chapter with good practice cases of SBL, which we encountered in Georgia, and present the lessons learned.

Science-business links are a challenging RDI policy field. This is particularly true in countries of the Former Soviet Union and their RDI systems, which were downscaled and underfunded for many years. Moreover, with the end of the Soviet Union, links were broken between research and business players across the region, and also inside the newly independent countries. The diverse actors (e.g. researchers, entrepreneurs, policymakers) are isolated from each other (self-contained). There are not only intersectoral gaps (weak or missing SBLs), but also the actors (on all levels) themselves create barriers to efforts to overcome these gaps. This has had negative effects on RDI management, value-creation capacities, and available public and private resources. To achieve deeper structural changes, RDI policy must be designed carefully, tailored to specific local strengths and weaknesses, and applied consistently for a quite a long time.

The background report for this PSF support exercise in Georgia sheds some light on the **conditions for SBL**[59]: the country features a liberal economic regime which offers supportive framework conditions to do business, especially compared to other EU Eastern Partnership countries. The foreign trade and export market patterns are fast changing; important reasons for this development are the latent tensions with Russia and the signing of the free trade agreement with the EU. The Georgian innovation system is marked by only ad-hoc or even absent science-industry relations and a lack of successful collaborative R&D support programmes. Some newly established innovation infrastructures (e.g. fabrication labs and innovation labs, TechParks) are available, although it seems too early to assess their results and impacts. Venture capital is lacking on the supply side, but only a few high-tech start-ups are available on the demand side. The labour market is characterised by an obvious skills mismatch and a generally rather poor educational output.

[58] The chapter on SBL was written with the support of Anna Kaderabkova, executive and research director at the Centre for Innovation Studies at the University of Economics and Management, Prague (Czech Republic).

[59] See Schuch et al., (2017): Background report.

5.1 Challenges to the current science-business links support policy

An important requirement for RDI policy design and for developing SBL facilitation and stimulation instruments is **reliable data on business R&D and innovation activities**. However, such data are not yet available in Georgia. The GITA has been working with the national statistical office GEOSTAT in the last two years on an annual survey of innovation. This should have led to fully integrating the EU innovation survey in the enterprise survey carried out by GEOSTAT. However, the planned survey was only implemented to a limited extent as not enough resources were available[60]. The findings for 2016 show that 13.1 % of companies surveyed introduced new or significantly improved products, and 13.9 % introduced new or significantly improved services[61]. This is rather low compared to other EU countries. The EU community innovation survey for 2014 revealed that about 70 % of companies introduced new or significantly improved products which were new to the firm, and about 50 % introduced products that were new to the market[62]. Innovation activities among Georgian enterprises concerned, primarily, the acquisition of machinery, equipment and software (21.5 % of responses), followed by design (15.6 %) and in-house R&D (13.8 %). Acquisition of external knowledge constituted 8.6 % and external R&D 5.2 %, respectively[63]. Most of these scores are significantly below those of EU countries: for example, on in-house R&D, Bulgaria scores lowest among EU countries with 15.3 % while the second lowest is Lithuania with nearly twice as many enterprises (25.4 %) performing in-house R&D than Georgian ones.

A good illustration of **Georgia's innovation capacity** is provided by its country position in the Global Competitiveness Index (2016-2017)[64]. In the 'Innovation' pillar, the country has low scores in particular on the following indicators:

- quality of scientific research institutions (127th out of 137 countries);
- availability of scientists and engineers (125/137);
- company spending on R&D (122/137).

In the 'Business sophistication' pillar:

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[60] Information by GITA representatives during interviews in February 2018.

[61] GEOSTAT, Distribution of Enterprises by innovation in production 2016: http://geostat.ge/index.php?action=page&p_id=2582&lang=eng

[62] EUROSTAT, Community Innovation Survey 2014, http://ec.europa.eu/eurostat/web/science-technology-innovation/data/database, last accessed 5 May 2018. Data in this survey have to be interpreted cautiously. Significant differences in product innovation can be observed between countries, which indicates that survey methodology is applied differently in the countries surveyed.

[63] GEOSTAT, Distribution of enterprises by enterprise engagement in innovation activities in 2016 (%): http://geostat.ge/index.php?action=page&p_id=2582&lang=eng

[64] World Economic Forum (2016). Global Competitiveness Report 2016-2017: http://www3.weforum.org/docs/GCR2016-2017/05FullReport/TheGlobalCompetitivenessReport2016-2017_FINAL.pdf

- local supplier quantity (129th out of 137 countries);
- state of cluster development (127/137);
- local supplier quality (115/137).

In the 'Technological readiness' pillar:

- availability of latest technologies (111th out of 137 countries);
- firm-level technology absorption (108/137);
- foreign direct investment (FDI) and technology transfer (94/137).

By combining data and analysis provided in different reports[65], we came to the conclusion that **major barriers for innovation** activity in Georgia are related to:

- lack of skills (quality of human capital);
- barriers in access to finance;
- overall investment climate, in particular legal barriers for RDI activity in public and private organisations;
- lack of collaborative culture among research and business.

These barriers are also addressed in Georgian strategic documents (e.g. Georgia 2020). In this chapter, we propose several instruments to address specific elements of the above-mentioned barriers.

In catching-up economies, attracting **R&D focused FDI** and creating knowledge spillovers from FDIs are recognised as a panacea to unlock the economy's innovation potential. In practice, the FDI policies of many of the Central and Eastern European (CEE) EU Member States were focused on FDI inflows with the main aim of generating employment in less economically developed regions. They mainly led to attracting low to mid-low technology and required a relatively low-skilled labour force, while investments have often been unrelated to domestic RDI capacities. Subsidiaries of multinational enterprises have played an important role in integrating the CEE economies into international production networks, but weak linkages between business and R&D sectors reduced the positive effects on national innovation systems. The integration process produced numerous positive effects, such as improvements in productivity and production quality, but its impact on innovation systems was rather weak. To reverse that trend, it would be more effective to focus on fostering demand-driven R&D related to the FDIs and on the quality of FDI developments. A good example of a quite successful strategy of this type is CzechInvest, the Investment and Business

[65] USAID (2017). Innovation and Technology in Georgia – Annual Report 2017.

SRNSFG (2016). Country Report Georgia, IncoNet EaP.

MOESD, GITA (2015). Environmental and social management framework. For Georgian National Innovation Ecosystem Project.

Development Agency of the Czech Republic[66]. It recognised the need for a shift from focusing on FDI investments in manufacturing and blue-collar jobs towards new sectors (e.g. software and ICT services, aerospace, advanced automotive)[67].

SBL policy design must **involve local stakeholders** in such a way that it enables and supports their creative and active participation, i.e. the design must be developed with them, not for them. SBL policy design must involve stakeholders from all institutional sectors representing all the relevant intra-sectoral variants/roles in the RDI system. Stakeholders from diverse sectors must interact closely during policy design. SBL require adequate motivation, opportunities and capacities on the part of the actors involved to be fulfilled simultaneously and to a sufficient extent and quality.

SBL support needs to take into account both supply (research) and demand (business) sides. Proposed improvements/changes should (to the maximum possible extent) build on available SBL success stories and take up the lessons learned towards better linking the knowledge-creation and application actors.

Among the preconditions highlighted at the beginning of this report, we would like to underline that **reducing the bureaucracy** for research will also be indispensable for productive research-business cooperation.

SBL policy and the portfolio of support measures must be linked to prioritisation and a possible smart specialisation process in Georgia. An update of and modifications to SBL policy and measures will emerge as a result of the smart specialisation process. S3 and SBL will have to be integrated so as not to multiply strategies and policies addressed to the same target groups. This integrated approach will facilitate implementation of S3, as there are already some financial instruments provided by SBL.

Our desk research and explorative interviews during two missions with representatives of all SBL stakeholder groups give a strong indication of a fundamental shortcoming in RDI policymaking: this concerns the **lack of coordination between governance actors responsible for SBL policy and for SBL support.** The importance of this issue led us to address it in chapter 2 above on overarching problems in Georgia's R&I system.

The **incompatibility of activities and measures offered by the SRNSFG and GITA** was often reported by different stakeholders as a major source of inefficiency in the RDI support system. Whilst the SRNSFG is focused on more traditional research support measures (grants), the GITA is strongly focused on commercialisation via start-ups (mostly in the IT sector) and young-generation

[66] See https://www.czechinvest.org/en

[67] Radosevic, S., Stancova Ciampi, K. (2015). External dimensions of smart specialisation: Opportunities and challenges for trans-regional and transnational collaboration in the EU-13. JRC Technical Reports: http://s3platform.jrc.ec.europa.eu/documents/20182/114874/JRC96030_External_Dimensions_of_S3.pdf/c4ede230-18fa-46fe-a996-079bbd7fe71d

entrepreneurial activity. In addition, the GITA is working on a large-scale matching fund for the commercialisation of R&D.

These GITA activities are not coordinated and integrated with the SRNSFG applied research funding scheme. Unfortunately, the latter does not work properly, as we learned from our investigations. In our view, a crucial issue is that financial incentives for companies are formally not possible. Therefore, the participation of companies is often only formal and co-funding conditions are mostly unfulfilled. Consequently, we were unable to identify a working and efficient SBL-specific tool implemented with measurable effects in the country.

5.2 SBL facilitation and support measures

Today, Georgia has at its disposal a portfolio of SBL facilitation and support measures, including:

- GITA as supposedly the main player in the innovation support system;
- SNRSF with its applied research grant scheme;
- banks, in particular the InnovFin financing scheme;
- Sakpatenti as Georgia's IPR agency;
- Enterprise Georgia taking care of business support;
- other/international support, including possibilities for applied research and innovation via Horizon 2020 to which the country has been associated since 2016.

The Georgian Innovation and Technology Agency (GITA)[68] was established in 2014. It is subordinated to the Ministry of Economy and Sustainable Development (MOESD). Its main task is to establish an innovation ecosystem in the country. Until now (April 2018), the agency's activities have focused on start-up support and innovation infrastructure. From a thematic point of view, the ICT sector has been a priority for GITA. In the innovation infrastructure component, two technoparks were opened in 2016, one in Tbilisi and one in Zugdidi. In addition, by 2016, the agency had established 22 fabrication labs (FabLabs), 4 innovation laboratories (iLabs) and 3 Community Innovation Centers (CIC).

In the access to finance component, GITA provides the following instruments[69]:

- Micro grants – with up to GEL 5 000 (EUR 2 089) for financing prototyping, travel, etc., by 2016, 80 projects had been financed and a total of GEL 276 424 issued (EUR 115 538).

[68] https://www.gita.gov.ge/

[69] The financial amounts of the following programmes were converted according to year of programme implementation, and by using the following EC website: http://ec.europa.eu/budget/contracts_grants/info_contracts/inforeuro/index_en.cfm

- Mini grants – with up to GEL 5 000 (EUR 2 089) for financing, by 2015, 17 projects (sectors: biotech, IT, new materials, energy efficiency) had been financed.
- Venture financing – investment provided of up to GEL 100 000 (~ EUR 40 000) with 5 % equity composition. According to the Prime Minister's initiative Start Up Georgia – venture financing, by 2016, 20 companies had received financing through this scheme.
- Matching grants – in the framework of a World Bank USD 40-million (EUR 34.4 million) loan project, GITA announced matching grants in spring 2018[70]. The budget for smaller grants is up to GEL 100 000 (EUR 34 800) with 10 % co-financing, and bigger grants up to ~ GEL 667 000 (EUR 232 000) with 40 % co-financing.

Furthermore, GITA offers consultancy and coaching to companies, and organises awareness-raising and innovation-stimulation events for the younger generation. These initiatives take the form of hackathons and science festivals[71].

The Shota Rustaveli National Science Foundation of Georgia (SRNSFG)[72] implements around 20 R&D support schemes, the most important being state grants for fundamental studies, grants for international research cooperation, and **grants for applied research**. The latter is the most relevant SNRSF scheme for SBL. The scheme has been implemented since 2012, with about 30 projects being funded each year.[73] Until 2018, funding for one applied research project was GEL 120 000 (about EUR 26 000) per year for a two-year period. From 2018, a revised call will be launched and funding per project can go up to GEL 420 000 (EUR 140 000) per year, which is substantial for the country[74].

The applied research grant scheme aims to discover applied research potential in Georgia and provide funding for innovative research projects. Special emphasis is put on innovative project proposals that have the potential to result in high-quality products which are in demand on local and international markets. Application, sustainability and the commercialisation potential of the research outcomes must be highlighted in the project proposals. Technology development should lead to prototypes, developing new or improved software, producing material, medical products, equipment etc., and are considered as expected outcomes of the applied research grants. Although the SRNSFG provides funding for the research component only, it cooperates with GITA and Sakpatenti to

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[70] 'Matching' here means that companies funded in the scheme have to match the public funding with a certain percentage of own co-financing.

[71] The overview of GITA activities has been based on the document National Innovation Ecosystem in Georgia (2017), made available by the GITA.

[72] http://rustaveli.org.ge/en

[73] http://rustaveli.org.ge/en/Applied-Research; no call was implemented in 2017 as the programme was revised. From 2018, the applied research programme will be launched with a new concept and terms.

[74] Conversion rates at the time of writing the report (spring 2018): http://ec.europa.eu/budget/contracts_grants/info_contracts/inforeuro/index_en.cfm

support the commercialisation of the funded research outcomes. Target groups of this call are HEIs in Georgia, research-focused institutions, independent scientific centres and researchers[75]. Business is expected to participate and co-fund such projects, but they cannot receive funding from the SRNSFG, which limits the attractiveness of the scheme for business.

The InnovFin financing scheme in Georgia is implemented by ProCredit and TBC banks[76]. The scheme provides support for debt financing of innovative projects, which are implemented by innovative Georgian small and medium-sized enterprises (SMEs) and small mid-cap companies. The support comes in the form of a guarantee provided by the European Investment Fund (EIF) and backed by Horizon 2020, the EU Framework Programme for Research and Innovation. The guarantee covers 50 % of each loan disbursed by the banks within the framework of the initiative to innovative projects[77]. The guarantee is expected to generate a loan portfolio of EUR 50 million in the case of ProCredit (with this budget it would be possible to fund 50 projects) and of EUR 80 million in the case of TBC bank.

The SME sector is important for the ProCredit bank – lending to the sector constitutes 25 % of its portfolio. The InnovFin budget is made available, e.g. for upgrading production lines. The current portfolio of InnovFin projects is not very innovative and innovative businesses are a rare case. According to the bank representatives, one of the reasons behind this is that many young and talented people go abroad. Companies should prioritise increasingly digitalisation and innovations; however, awareness of these issues among businesses is rather low.

The scheme is foreseen with ProCredit for two years (2017-18) preliminarily; and with TBC it started in November 2017.

Enterprise Georgia[78] was established in 2014 and fits into the national innovation system as a business support agency. It is not tasked with innovation stimulation, but can also support companies' R&D activities. Its mandate is to facilitate development, growth and internationalisation of the country's private sector. To this end, it implements a portfolio of schemes focused on SMEs. It helps with access to finance by co-financing bank loan interest rates and credit guarantees.

Enterprise Georgia has been implementing a micro and small business support programme since 2015. It is designed to render financial support and consultations to micro and small businesses across Georgian regions. Financial assistance entails GEL 5 000 – 15 000 (EUR 1 600 – EUR 5 000) grants for start-ups or expanding companies while technical support offers individual and group

[75] The outline of the applied research grant scheme is based on a concept note for revising the scheme, made available by the SRNSFG in February 2018.

[76] https://www.procreditbank.rs/en/strana/7641/the-innovfin-programme-#

[77] See: http://www.eif.org/what_we_do/guarantees/news/2017/innovfin_procredit_georgia.htm, last accessed 10 April 2018.

[78] http://enterprisegeorgia.gov.ge/en/home

consultations where entrepreneurs have an opportunity to get relevant business knowledge.

As of November 2017, under the programme 'Supporting Micro and Small Businesses', Enterprise Georgia has supported 1 890 projects. In total, 2 790 beneficiaries have received matching grants up to a total of GEL 14 million (EUR 4.6 million)[79]. Enterprise Georgia also deals with training for entrepreneurs, e.g. for the Deep and Comprehensive Free Trade Area (DCFTA) with the EU.

Sakpatenti[80], the National Intellectual Property Center of Georgia is in charge of the national Intellectual Property system. It fulfils the functions of a typical national IP agency, such as granting patents for inventions and utility models, registering trademarks, designs, appellations of origin and geographical indications, new plant varieties, and providing a deposition service of copyright-protected works. It also runs a training academy on IP issues. It is involved in the SBL support schemes run by other public actors, and lends its expertise to the selection of applied research projects at the SNRSF and in various GITA support lines. Sakpatenti runs a branch office at the GITA location in Technopark Tbilisi to provide advice for GITA clients.

Other/international: since the country's independence, international linkages and support for research have been very important in continuing research fields and maintaining research capacities. This has also included support for research-business links, a field which has become increasingly important in recent years. The main cooperation tools with the EU are its association since 2016 with Horizon 2020 and DCFTA, which is very important for business. Horizon 2020 offers various funding lines for stimulating research-business cooperation (e.g. the SME instrument). Via the World Bank-sponsored Georgia National Innovation Ecosystem (GENIE) project, USD 40 million (~EUR 35 million) have been allocated for innovation development in the country. Measures are implemented via the GITA and cover innovation infrastructure (e.g. innovation centres), funding programmes (e.g. matchmaking grants), and innovation services (e.g. training)[81].

5.3 Transfer of knowledge

The transfer of knowledge needs an enabling environment and some degree of absorptive capacity. Technology brokers can be instrumental in supporting technology transfer and facilitating research-business cooperation. However, researchers with research and solutions relevant for business and societal uptake must themselves actively work on cooperation with business and other societal

[79] Information provided by Enterprise Georgia in December 2017.

[80] http://www.sakpatenti.gov.ge/en/

[81] GITA, MOESD (2015). Environmental and social management framework for Georgian National Innovation Ecosystem Project.

actors. To this end, they will need clear and simple rules, advice, and a favourable IPR regime at their institutions.

When developing a support system for technology transfer and commercialisation it is important to understand the size of supply and demand. On the supply side, the most promising sectors are biotechnology, with world-class scientific expertise, and applied physics research used for other sector needs. However, the number of research fields with high commercialisation potential is limited. On the demand side, in 2015, the volume of the Georgian technology sector amounted to GEL 1 869 million (EUR 729 million)[82] and accounted for 5.9 % of GDP. The ICT share in the total sector contributed up to 90 % of this amount. There are up to 1000 companies/organisations active in this technology field. Most companies operate in computer programming and consultancy (223), followed by telecom (149) and wholesale ICT equipment (131). High-tech industry is underdeveloped with no current activity in many subsectors. However, there are some promising activities that are gradually getting stronger. In high-tech, the main subsector is biotechnology with GEL 143 million (EUR 56 million) of local production of pharmaceutical goods. Automotive and aviation subsectors are also worth mentioning, with approximately GEL 25 million (EUR 9.8 million) export value each in 2015[83]. This structure and visible mismatch should also be taken into consideration when support instruments are designed.

5.3.1 Brokers as technology transfer and science-business cooperation drivers

In Georgia, success stories of research-business cooperation and contract research at universities and research institutes show that intermediary structures (i.e. technology transfer offices) at the level of research organisations are not necessary for the development of functioning and productive SBL.

5.3.1.1 Recommendation 17: Establish a network of brokers and related back office for technology transfer and science-business cooperation.

In an environment of limited supply and demand (deal flow), as we have observed in Georgia, a well coordinated network of active, knowledgeable and well-motivated individual brokers active within public research institutions (i.e. one in each university or research institute) could play an important role in stimulating different forms of science-business cooperation, in particular technology transfer. While we are aware of plans at the GITA to establish a fully-fledged national technology transfer office, we **consider this 'lighter version' as more cost effective and closer to the customers**. Brokers will have to follow a customer-oriented approach, and help as much as possible and effectively with research players and companies. The usual tasks for such brokers are:

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[82] Conversion rate as of December 2015, according to: http://ec.europa.eu/budget/contracts_grants/info_contracts/inforeuro/index_en.cfm

[83] USAID (2017). Innovation and Technology in Georgia – Annual Report 2017.

- project scouting;
- partner search;
- contract negotiations;
- IP transactions.

Their activity must be **subject to quality and effectiveness control procedures**, and related indicators for measurement will have to be specified. Their salaries should be based on a limited base-line, and combined with a success fee.

For the same reason of a limited deal flow, instead of creating technology transfer office structures at each public research organisation level, one **central (national) back office should be established** to coordinate the network of brokers providing them with standardised back-office services. This central (national) back office could map the available brokering capacities within the existing organisations, and identify their needs/barriers for growth (including systemic/administrative burdens). The broker system should be able to do both a technical and business appraisal of those innovations that have been scouted.

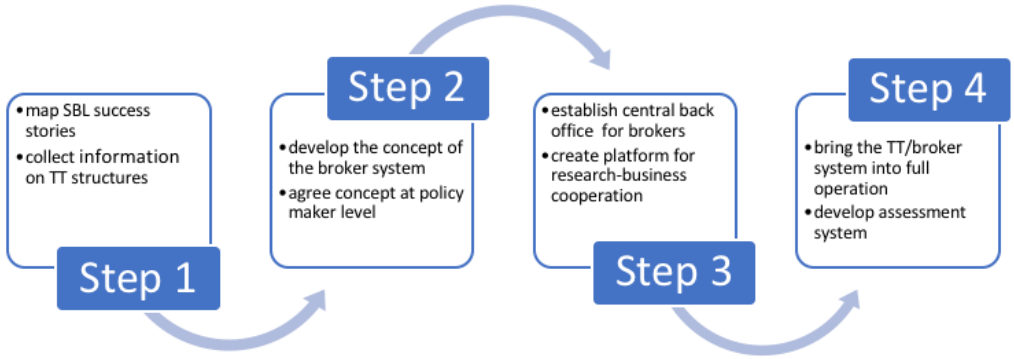
Facilitating science-business cooperation requires different ways of bringing people together. Associations, clusters and interest organisations could serve as focal points for gathering and channelling information on business needs to researchers. But networking among researchers and among researchers and business is equally important. An **online matchmaking tool** could be instrumental in this respect.

Key operational steps:

- Conduct a systematic mapping of the country's SBL success stories. Identify lessons learned from these cases and apply these to policymaking and practice.
- Collect and assess information on available technology transfer (TT) support structures and/or individual experts for technology transfer at public universities and research organisations.
- Develop the broker system concept. Draw up a business plan for the network of brokers, covering their personnel costs, cost of back office, etc. Assess the need for recruiting experts to this brokerage task. Organise stakeholder involvement workshops and gather input from business, research organisations, Sakpatenti and individual brokers for the optimal organisation of the broker system.
- Agree the concept at policymaker level, e.g. in the revamped RIC.
- Establish a central (national) back office for SBL intermediaries (brokers) – assess the possibility of allocating this activity within the GITA. Subsume available technology transfer entities and brokers under the roof of the common back office. If required, recruit additional brokers and bring the whole system into full operation.

- Create a platform (networking tool) for research-business cooperation for the direct involvement of both knowledge and demand actors. This tool should be integrated in the dissemination website/cross-linking websites, which were suggested in the previous chapter Support for researchers active in SBL.
- Develop a methodology and a related indicator system to monitor the quality and effectiveness of SBL intermediaries, in particular brokers.

Figure 14: Activity line for technology transfer drivers



5.3.2 Support for researchers active in science-business links

5.3.2.1 Recommendation 18: Provide clear and simple rules and advice for researchers active in SBL.

Successful science-business links, in particular R&D cooperation in any form (collaborative research, research intensive services, licensing, etc.), are always channelled through and deployed by **highly motivated and dedicated researchers (experts). They should play the role of SBL agents** stimulating formal collaboration between research organisations and companies. Framework conditions, including legal and institutional framework conditions for science-business cooperation, should focus on and be built around the needs of the most-active people.

Specific public support for experts should cover:

- a clear and simple framework for science-business contracts;
- clear and enforceable rules for engagement of R&D organisation employees in company activities (i.e. contract research, mobility schemes, industrial fellowships);
- advice on possible synergies/sharing available infrastructure.

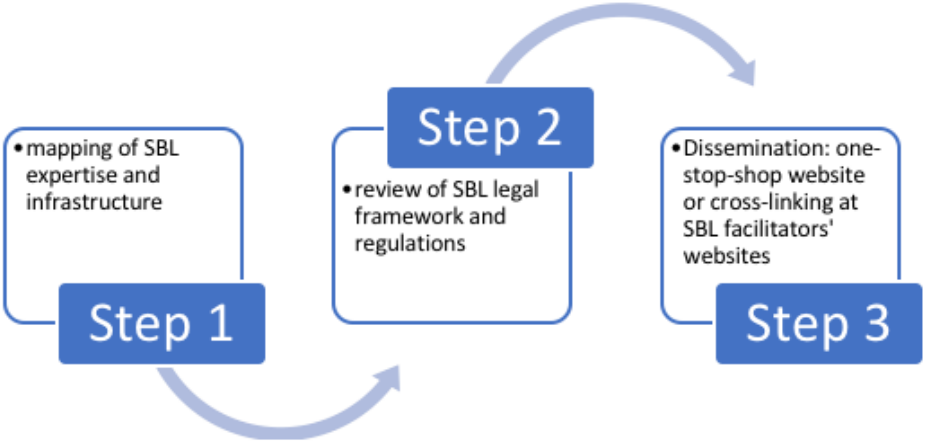
Key operational steps:

- Introduce the systemic mapping of available SBL expertise. This can build on a few previous studies, e.g. USAID Governing for Growth (G4G) in Georgia: Innovation and Technology in Georgia. Annual Report 2017. These activities

should be linked to data collection and establishing an R&I database, recommended in the chapters on priorities and the PRFS.

- Review the existing legal framework and regulations at all institutional levels to identify and remove red tape for individual and institutional science-business collaboration. Develop standard documents, e.g. for science-business contracts, and make them available to researchers and businesses.
- The information collected, the standard documents, as well as a compilation of available innovation support and facilitation measures in Georgia should be made available to the public, i.e. via a dedicated one-stop-shop website, or via the websites and cross-linking of the relevant organisations (GITA, SNRSF, Enterprise Georgia and Sakpatenti).

Figure 15: Activity line for support of researchers in SBL



5.3.3 Favourable Intellectual Property Rights regime

Intellectual Property Rights are one of the key elements of every modern national research, development and innovation system. An IPR system which is too rigid or too weak could negatively influence the research activity, the commercialisation efforts of public research organisations, as well as the innovative performance of companies (and have negative repercussions on the economy). In principle, Georgian IP legislation and the internal rules of funding agencies (e.g. SNRSF) comply with the dominant model in the EU. The employers (the public research institutions: universities and public research organisations) own IP created by the employees (researchers), but participation of the authors (inventors) in income generated from exploitation of IP is obligatory[84]. This is also confirmed in the only two existing internal IP policy documents among public

[84] Information provided by the SNRSFG: from 2016, in programmes and related regulations for basic, applied research calls (also for other calls for diaspora, postdocs, etc.) in the case of commercialisation of the research outputs, the revenue distribution scheme was 70 % for the grantees (35 % – host institute/university, 35 % – inventors) and 30 % for SNRSF. From 2018, this has been changed to 85 % for the grantees (35 % – host institute/university, 50 % – inventors) and 15 % for SRNSFG.

research institutions, at Ilia State University (which is one of the biggest public universities) and at a biotech research institute. The national IPR framework conditions are favourable for commercialisation of research results. But the **limited awareness of the strategic importance of IP and of its commercialisation** for research organisations, as well as the lack of experience in providing the necessary framework conditions at the institution level, hamper the effective use of IP as a driving force of innovation.

5.3.3.1 Recommendation 19: Ensure that a favourable IPR regime is widely implemented and will facilitate research-business cooperation and technology transfer.

Each public research institution must define the IP policy in its internal regulations. The most important issues which should be addressed in these regulations are:

- rights and obligations of authors (researchers) and institution;
- share of income, coverage of application and enforcement costs, etc.;
- rules of commercialisation.

Statistics from Sakpatenti for 2016 show that patent applications filed by universities numbered 25 for inventions and 6 for utility models. In addition, 82 preliminary patent searches for universities and GITA were conducted. In 2017, overall patent applications with Sakpatenti declined by 10 %, and a low level of patenting activity among local companies (5-6 patents per year) was noted[85].

Measured in terms of IPR, companies are only performing R&D activities at a very low level. However, it would be more important to see the take-up of R&D. Sakpatenti has specialists in both IP and technology and provides support for patenting abroad[86].

In line with its action plan for 2015-2018, Sakpatenti has taken a range of measures for stimulating IPR protection in the research sector and innovation activities in the country overall[87]. According to the action plan, the following measures constitute the first stage of assistance, which is focused on assistance for R&D projects, in particular:

- A free-of-charge search for the technology state of art has been introduced. It offers to conduct a preliminary patent search for scientists and researchers at the starting stage of research projects to determine state of art in the field.
- Assistance is provided for drafting patent applications.

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[85] Kutsia, M. (2017). Activities of National IP Center Sakpatenti. Supporting STI at Universities and Research Institutions, Power Point Presentation, 29.03.2017, Tbilisi.

[86] Sakpatenti /Georgia is not a member of the Eurasian patent office, the regional IP cooperation among Former Soviet Union countries. See: https://www.eapo.org/en/

[87] Sakpatenti Action Plan 2015-2018, made available to the IEG by Sakpatenti.

- Support is provided for obtaining funding for patenting, at least for the international phase of PCT applications.
- Patent fees for R&D institutions have been reduced by 70 % to facilitate patenting activities in universities.
- Sakpatenti offers to draft IP policy for universities and R&D institutions in order to determine ownership and other aspects of IP related to works created through research processes in these entities.

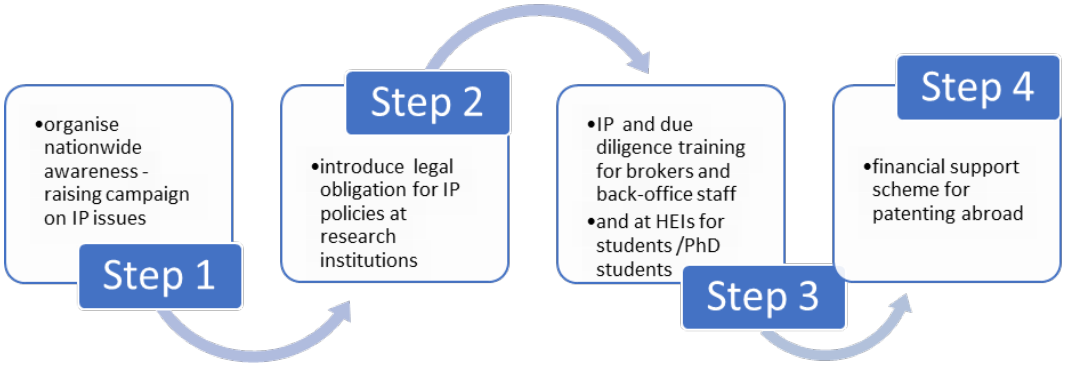
Although these are all very useful activities, they have only been taken up by research players to a limited extent. In particular, the offer to draft IP policy for the research institutions has only been taken up by the one institute in the biotech sector (mentioned above) until now[88]. It is obvious that IP needs to be regulated at the institutional level and the availability of advice on this from Sakpatenti is welcome. Although IP is a longer-term issue to be solved, it is necessary to consider measures to improve the situation, and at least **IP policy regulations at the main public research institutions should be made available.**

Key operational steps:

- Organise a nationwide public awareness-raising campaign on IP issues (e.g. against infringement of patents, breaking copyright law: use of illegal products, music, films, etc.) to create a new perception of ownership and the value of IP.
- Implement and execute a legal obligation for all public and private research organisations to introduce IP policies in their internal regulations.
- Organise training on IP issues and on due diligence (technical and business appraisal of innovations) for brokers, and offer brokers the support of highly qualified and experienced staff in the central back office (see Recommendation 17).
- Introduce a basic course (curriculum, e.g. 16 hours) on IP and copyright law for all students in relevant scientific fields, or at least for first-year PhD students (in this case as an obligatory pilot).
- Assess the possibility of establishing a financial scheme (instrument) to support patenting abroad.

[88] Information provided by Sakpatenti in April 2018.

Figure 16: Activity line for a favourable IPR regime



5.4 Co-production and co-funding

Strengthening collaborative R&D: among many other forms of strengthening SBL collaborative R&D projects play a vital role. Collaborative R&D could cover a full-scale programme portfolio in size and complexity and requires technical, organisational and financial resources.

5.4.1 Collaborative structures – competence centres

A competence centre (CC) is a clustering and collaborative tool, designed in a way that actors from diverse knowledge supply and demand sectors are motivated to cooperate on development and application of marketable solutions and outputs (products). CCs enable companies to absorb research, in particular those companies with limited own R&D resources. CCs help them **improving R&D capacity, acquiring and marketing innovations. Moreover, CCs support collaborative projects between different partners** (SMEs, big companies and public research organisations).

The main focus of CC activities is usually technology services, industrial research and development, skills development, and quality assurance. CCs should be driven both by industry and the research partner to ensure deliberate tension between industry requirements and the research partner's capabilities to provide solutions. They should be set up close to industrial concentrations (producers of products or services, e.g. wine). That is why in many countries, in particular EU Member States, CCs also play an important role in regional policy and economic development[89]. The expected results are to improve capacities for innovation, technological development and cooperation in the business sector (especially for SMEs) and in enterprises which do not have sufficiently developed R&D

[89] Report of the CREST Working Group on Industry-Led Competence Centres – Aligning academic / public research with Enterprise and industry needs, December 2008.

Mid-Term Evaluation of the Competence Centre Programme in Estonia, Innovation Studies, Tallinn 2008

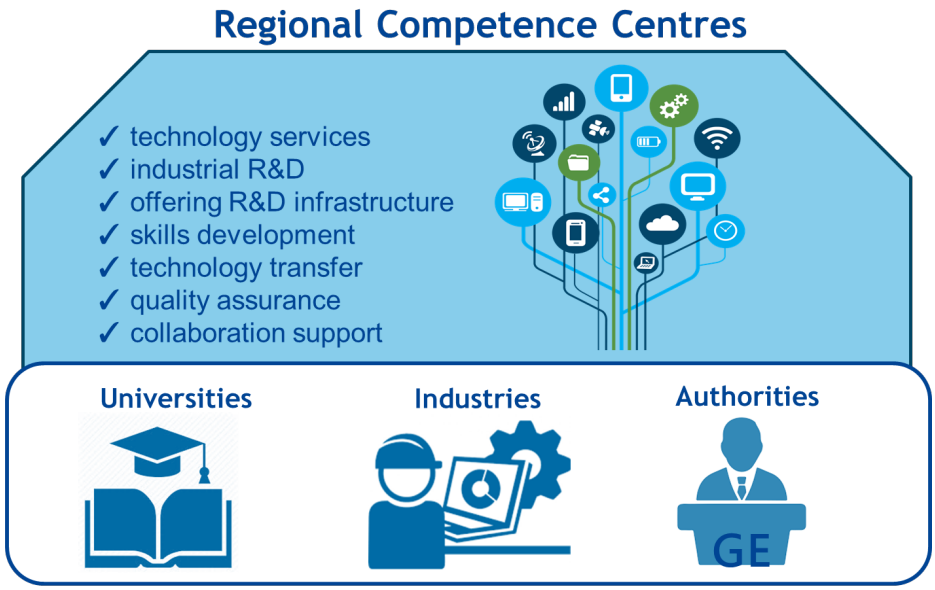
infrastructure and need a larger concentration of expertise in one or more priority thematic areas.

5.4.1.1 Recommendation 20: Introduce Competence Centres as instrument for applied and collaborative research, and for regional development.

CCs should be organised around or linked to universities in the regions (outside Tbilisi) to make them more accessible for SMEs and able to serve as their knowledge base. This regional focus should also help to strengthen applied research in the regions as most R&D activity is concentrated in Tbilisi. CCs can be publicly owned or may also be organised as a project. They should be funded in a co-financing arrangement, involving public and private resources.

From the outset, it will be important to involve regional stakeholders in the programme development to ensure their commitment. Apart from the regional/local Higher Education Institutions in particular this will concern the regional and municipal administrations and local business interest organisations.

Figure 17: Competence centre approach



We make a clear differentiation between the two concepts: National R&I centres (recommended above in chapter 3.1.3) overcome the fragmentation of the Georgian research system, while CCs serve to stimulate applied research and close to market technology development. R&I centres are based on existing or upgraded R&D infrastructure (with all the necessary legal and financial instrumentation), while CCs focus on capacity building at the regional level. We assume that, because of the concentration of R&I activities in Tbilisi, most R&I centres will be based in the capital. CCs should complement the more research-

oriented R&I centres and contribute to regional development. Technology Readiness Levels (TRLs), as used by the EC in the Horizon 2020 programme, can be applied for differentiating between national R&I centres and Competence Centres. The CCs should be at a higher TRL level than the R&I centres.

International practice case: Competence Centre Latvia

Some recent policy interventions appear to having positive effects on industrial innovation in Latvia. The competence centres created under the auspices of the Smart Specialisation Strategy using EU Structural Funds seem to be the most successful instrument promoting innovation in Latvia at the moment. The Centres have helped to create bridges between research centres and industry, and are perceived very positively by the different actors in the Latvian innovation system, firms in particular. Apparently, these CCs have developed a model that is suitable for the needs of private firms' industrial innovation, making investment in R&D projects more efficient. The firms see them as valuable partners and look forward to the continuation of the scheme by the national authorities, when EU funding is phased out[90].

The European Regional Development Fund (ERDF) provides about EUR 40 million per year in innovation funding, from which these centres are financed. They are based at universities and connect companies with research relevant to their product and process development. Among the eight CCs, the one dedicated to forestry and wood processing is an example of good practice as it has managed to bring together and generate synergy between different types of actors in this industrial and technological area. Concrete projects were put forward by private woodworking firms in Latvia, which have been using the CC to interact with other organisations and develop their own knowledge competences further[91].

International practice case: Competence Centres Croatia

CEKOM Competence Centres in Croatia is a concept presented in the Croatian Smart Specialisation Strategy 2016-2020[92] and Croatian Research and Innovation Infrastructures Roadmap[93]. It is implemented with the support of EU Structural Funds under the Operational Programme Competitiveness and Cohesion 2014-2020[94]. CEKOMs are defined as individual (but networked) entities driven by industry needs and designed to support capacity building in the business sector (mainly SMEs lacking their own R&D capacities). R&D projects will be carried out in the framework of the centres. They must be focused on development, applied research and the commercialisation of results, and be in line with the thematic areas specified in

[90] PSF Latvia, p.45f.

[91] PSF Latvia, p.66f.

[92] http://s3platform.jrc.ec.europa.eu/documents/20182/222782/strategy_EN.pdf/e0e7a3d7-a3b9-4240-a651-a3f6bfaaf10e

[93] https://mzo.hr/sites/default/files/migrated/croatian_research_and_innovation_infrastructures_roadmap.pdf

[94] https://strukturnifondovi.hr/vazni-dokumenti-operativni-program-konkurentnost-i-kohezija/

Croatia's Smart Specialisation Strategy. We want to stress that the CEKOMs are still in the selection phase, and no results of their operation are available yet. Nevertheless, this approach to CCs and the selection procedure provide an instructive example for Georgia.

Funding mechanism: all funding is allocated in a two-phase selection process via competitive calls for proposals with clearly defined expectations and a selection of the successful proposals by independent experts. The calls are organised by the Croatian Ministry of Economy, Entrepreneurship and Crafts as the implementing institution for the EU Structural Funds in Croatia. The selection procedure (phase 1) has been based on a call for expression of interest. Presentation of concepts and partners began in 2016 and has resulted in 34 projects being preselected for phase 2. The currently on-going selection procedure in phase 2 is based on a limited call to preselected projects and requires submission of the full applications[95]. The grant scheme's total budget is EUR 105 million, with a maximum grant per application of up to EUR 15 million.

Three models of CEKOMs are eligible for support:

Model 1 with subdivisions:

1A, in which CEKOM is a research and dissemination organisation (with the exception of public research organisations enrolled in the Register of Scientific Organisations), which has effective cooperation with at least two entrepreneurs and, where appropriate, with one or more research and dissemination organisations (public or private) on R&D projects. Effective cooperation has to be proven by an 'Agreement among the Applicants Consortium for Effective Cooperation on R&D Projects'.

1B, in which this model CEKOM is a consortium of applicants between at least two entrepreneurs and one or more public research organisations enrolled in the Register of Scientific Organisations and have effective cooperation on R&D projects.

Model 2

In model 2, CEKOM constitutes an innovation cluster involving at least three entrepreneurs and, where appropriate, one or more research and dissemination organisations that have effective cooperation on R&D.

Model 3

In model 3, CEKOM is a legal entity that manages research infrastructure.

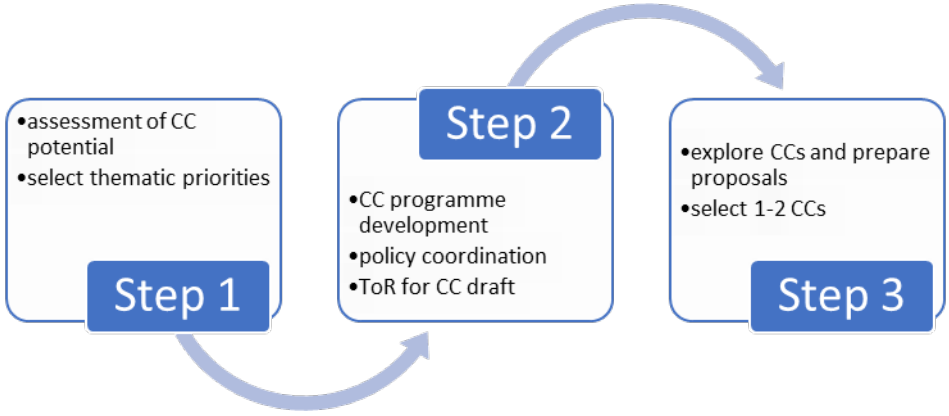
Key operational steps:

- Assess the potential of universities, in particular outside Tbilisi, to take a leading role in the creation of regional CCs and involve regional administrations in the programme development process (possibly ensuring a regional co-funding component).

[95] https://strukturnifondovi.hr/natjecaji/podrska-razvoju-centara-kompetencija/

- Based on a priority-setting exercise and an analysis of the economy sector's needs, define thematic priorities for the regional CCs. Should the S3 approach be taken in priority setting, ensure close coordination with the S3 exercise and apply its results to the CC programme development – see chapter on priorities.
- Establish under the GITA a specific CC programme to pilot CC activity in one or two locations. Agree a specific budget for the programme with the RIC, the responsible ministries (MES, MOES) and regional administrations.
- Develop the ToR in close coordination with key stakeholders. Specify the key elements of CCs and selection criteria: the aims of the programme, target groups, eligible organisations and activities within the framework of the programme, define public funding rates and co-funding from business, selection process and criteria.
- Explore possible CCs in the regions and work actively with the regional universities to develop a limited number of potential CCs: select partners, draft work and business plan, define expected outputs.
- Set up an evaluation panel, including scientific and business experts from Georgia and abroad. Select one or two CCs for the pilot phase.

Figure 18: Activity line for Competence Centre programme



5.4.2 Funding for collaborative research and development

In a systemic approach, each national RDI system requires a portfolio of instruments supporting collaborative R&D. This portfolio must cover the whole range of project sizes and complexity, from small grants with minimum administrative effort (e.g. level EUR 5 000), through medium grants with a low entry barrier (e.g. level EUR 50 000), up to big matchmaking grants (e.g. minimum EUR 200 000). **In the current set-up with the GITA and SRNSFG instruments, we do not see enough coordination and stimulation of collaborative R&D.**

In spring 2018, GITA implemented a call for start-up matching grants[96]. This aims to stimulate innovation and the creation of innovative enterprises through the development/adoption and commercialisation of innovative products and services. It is focused on companies (early-stage private and small enterprises), and features no obligatory collaborative research-business elements. Introducing collaborative elements into this scheme would lead to joint technology development and move beyond R&D commercialisation[97] and technology adoption from abroad. This would also ensure better involvement and use of the local research base in the economy.

Besides the size of the supported projects, issues of grant leadership, financial management of the grant and IPR must be solved. A standard approach in many of the EU Member States is to allow private companies to access public financial support (within the state-aid regime), lead private-public consortia and own rights to project outputs. **We recommend revising the current funding portfolio and tuning it towards collaborative R&D.**

A critical issue for any new or revised collaborative scheme is companies' absorptive capacity. According to USAID and World Bank reports, the most promising sector to innovate in is IT, while others like automotive parts, aerospace (airplane maintenance) or biomedicine are at an early stage. However, traditional sectors, such as agriculture, food processing or the wine industry, should not be excluded as Georgia is traditionally strong here and these sectors are growing. Major challenges for innovation activities within companies include a lack of skills (qualified personnel) and a shortage of money for investments. The lack of skills and human resources are specifically addressed in chapter 5.5 on mobility below. In addition, the weak collaborative culture and a short-term planning focus of business activities may significantly hamper the implementation of collaborative measures.

5.4.2.1 Recommendation 21: Tune the R&I funding portfolio towards collaborative R&D – modify the SRNSFG's applied research scheme and introduce innovation vouchers

<u>SRNSFG applied research scheme</u>

This scheme has a few flaws. A sophisticated three-step selection procedure is currently used for selecting projects. An investigation should be carried out to assess if this is really appropriate for the type of investment/grant allocated and whether or not a slightly lighter procedure could be used. Even the most sophisticated procedure will be of little use if there are general flaws in the scheme set-up. This concerns the co-funding of private business, which has been

[96] See https://grants.gov.ge/en/Grants?call=79

[97] From our investigations we can deduct that only limited stocks of R&D that can be commercialised are available in the country.

provided to only a very limited extent, falling short of the required amount that was promised in the project proposals[98].

This shows the fundamental **problem that companies cannot receive public funding from the SRNSFG**, which limits their interest in the scheme and leads to research projects rather than innovation projects. A key to making the scheme work and fit well in the context of Georgian innovation support is to give companies the opportunity to receive funding. This would offer them an incentive and encourage them to make an active contribution to the project.

We have discussed the options for solving this issue with the stakeholders, but a final conclusion has yet to be drawn. One option would be to amend the law and allow the SRNSFG to allocate funding to companies (which is currently not possible). Another option would be combined funding from the SRNSFG and GITA/Enterprise Georgia, the first applying to the researchers, and the second/third to the company participants in a project[99].

There were no calls in 2017, but another call round is being prepared and was imminent in spring 2018. It is important that it fits into the overall innovation support system. Close coordination and complementarity with GITA's matchmaking grant scheme (undergoing implementation in spring 2018) must be ensured. The involvement of GITA, Sakpatenti and foreign experts in the assessment and selection of proposals is very useful and should be continued.

Once again, the TRL classification could be applied to differentiate between GITA's applied research scheme and its funding instruments.

Key operational steps:

- Assess past and present efforts to implement collaborative R&D schemes to design a portfolio of well-tailored and complementary instruments.
- Revise SRNSFG's existing applied research funding scheme and consider administrative simplifications, as well as simplification of the scheme overall (e.g. reduction of three consortia options to one collaborative research-business).
- Ensure close coordination with GITA to avoid duplication of funding schemes and funding – e.g. with GITA's matchmaking grants.
- Give private companies access to public funding from the SRNSFG. Change the legal basis accordingly: concretely, in the Georgian Law on Grants it is foreseen that private entities are eligible to get grants from GITA programmes. This regulation should be extended to the SRNSFG programmes supporting collaborative research (e.g. the applied research scheme). Alternatively,

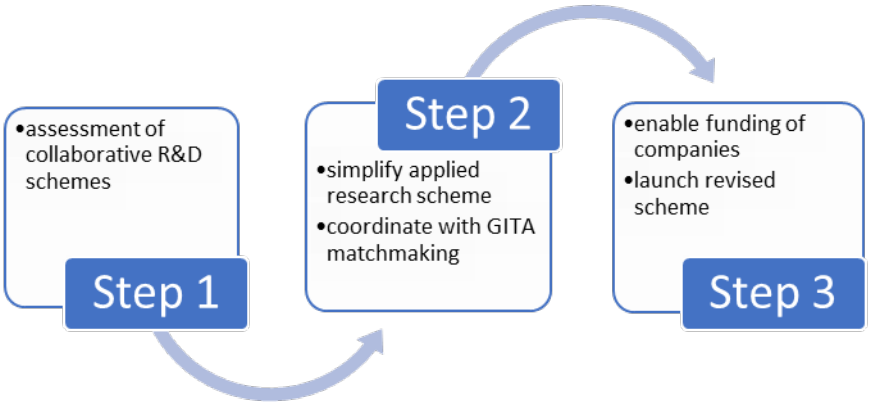
[98] Information from interviews with SRNSFG representatives, February 2018.

[99] Examples are available of such joint programmes among R&I funds, e.g. in Norway, among Research Council Norway and Innovation Norway.

implement a combined scheme from the SRNSFG and GITA and/or Enterprise Georgia, the latter two providing funding for companies.

- Launch a revised applied research scheme or merge with the GITA matchmaking scheme: in both cases, collaborative R&D must be supported to ensure adequate links between the national research base and the company sector.

Figure 19: Activity line for SRNSFG applied research scheme



Innovation vouchers for initiating SBL

We recommend introducing a voucher scheme for lowering the transaction costs of (starting and/or developing) science-business interactions, with a very low (minimum) administrative burden and limited funding (e.g. EUR 5 000). Vouchers offer several advantages for innovation systems in countries which have emerged from the FSU:

- They require relatively low public investment in the programme. While the grant seems low, it must be considered that prices in Georgia (which is a lower-middle-income country according to World Bank definition)[100] are generally much lower than, for example, in western European countries, and consequently the impact of the grant is greater.

- They help to build contacts and foster a collaborative culture among research and business actors.

- They address the lack of demand from business for research services (a weakness often mentioned by researchers in the region).

- They allow a project pipeline to be developed for more significant support programmes or investment. GITA's micro and mini grant schemes cater

[100] World Bank (2018). https://data.worldbank.org/country/georgia

mainly for starting up companies and improving products and services. They have yet to take up the link between the research base and business. We see the need for a light scheme here which can prepare the ground for the more sophisticated and financially substantial schemes of the SRNSFG and GITA. A quantitatively higher amount of innovation vouchers can serve as a test bed for cooperation among research and business actors.

Such innovation voucher schemes have been implemented and used to stimulate SME-research cooperation in many countries, in particular in some Eastern European countries. Here we can cite the examples of Czech Republic, Poland and Lithuania. Vouchers have already been piloted in Georgia in the frame of the EU-funded FP7 project ener2i in the energy sector. From the panel members' discussions with GITA staff before the PSF project (in the framework of the ener2i project) we learnt that GITA has been planning the introduction of such a voucher scheme but preparations have come to a halt.

Lithuania has provided innovation vouchers for some time and in the recent PSF review a more substantial follow-on scheme was proposed[101]. Georgia has taken the opposite approach and started immediately with more solid schemes (SNRSF applied research and GITA matchmaking) without sufficient groundwork /stimulation work among research-business players.

In a classical approach, the voucher budget amounts to EUR 5 000 – EUR 10 000. Usually, the budget is allocated to an SME to purchase research services from research performers[102]. The design of the voucher scheme should be adapted to national requirements, and companies should also be allowed to receive part of the funds. Typical activities to be implemented with the voucher scheme include prototyping, market and feasibility studies, and material and design studies.

Complementarity of the voucher scheme with other GITA funding programmes, in particular the matchmaking scheme, should be ensured. Here, vouchers can lead to a project pipeline for the matchmaking scheme. The innovation system should go beyond technology adoption from abroad and, with the help of collaborative schemes, lead to local technology development and innovation.

International practice case: ener2i innovation vouchers

Innovation vouchers, a funding scheme for **small-scale joint innovative projects among SMEs and research institutions,** was first implemented in Georgia in 2015. Within the framework of the EU's FP7-funded ener2i project, the Energy Efficiency Centre Georgia (EECG) and its international partners from Austria (Centre for Social

[101] Bullinger, H.-J., Reid, A., Lemagnen, M., Wise, E. (2017). Specific Support for Lithuania. Fit for the Future. EU Horizon 2020 Policy Support Facility: https://rio.jrc.ec.europa.eu/en/policy-support-facility/specific-support-lithuania

[102] OECD (2010): Innovation Vouchers. See also The Innovation Policy Platform, https://www.innovationpolicyplatform.org/content/innovation-vouchers, last accessed on 30 April 2018.

Innovation – ZSI) and Germany (North-Rhine Westphalian Energy Agency) launched a call, evaluated and financed projects for **a budget of EUR 4 000 per voucher**. Out of 18 projects submitted, six such voucher projects were supported for a total of EUR 24 000. The competition was financed by the EU via the ener2i project[103].

The voucher was allocated to an SME which had to collaborate with a research partner. Thus, the research work is driven by the needs of the company, as opposed to a traditional approach whereby research results are generated and should then be applied and transferred to business or society. The voucher budget could be spent on R&D-related manpower required for project implementation (e.g. technology or market studies, prototyping, energy or innovation audits, etc.) or travel arrangements facilitating knowledge transfer on a national and international level.

Funded projects were implemented over a six-month period and most projects finished early in 2016. The voucher projects cover different energy-related topics, including solar, construction material, biomass for energy production and heating[104]. Evidence from a project's internal evaluation has shown that contacts among SMEs and research performers were successfully created, prototypes were developed and technology assessments conducted. Success cases included, for example, a Moldovan farm which became energy independent. It used its own bio-resources which were processed into pellets for heating and energy production. The cost of energy was cut, and the know-how spread to farm enterprises in the same village.

International practice case: innovation vouchers in Lithuania

A support programme for innovation vouchers has been implemented in Lithuania for several years already. An evaluation of the 2012-2014 calls was conducted last year and revealed good results[105]. During this period, three calls were implemented and a total of 815 projects were funded with EUR 3.5 million; 776 of them were completed successfully. The vouchers had a positive impact on the engagement of SMEs in R&D activities. About 20 % of the SMEs surveyed in the evaluation, which had no R&D experience before the voucher project, had started new R&D activities shortly after the end of the voucher project. 66.5 % of surveyed SMEs either continued to cooperate with the research organisation or intended to do so after the project. No significant impact on SMEs business productivity and competitiveness indicators was measured in figures, which is not surprising given the limited investment via vouchers. However, in the survey among supported SMEs, two thirds of respondents commented that the instrument had a positive effect on the development of new products and services, and on competences. Successful examples of SMEs also include some which managed to follow up and receive funding from more significant funding programmes[106].

[103] The call documentation, including Terms of Reference and Application Form are available at the project website: https://ener2i.eu/innovation_vouchers/georgia

[104] Information on funded projects is also accessible at the project website: https://ener2i.eu/innovation_vouchers/funded_projects

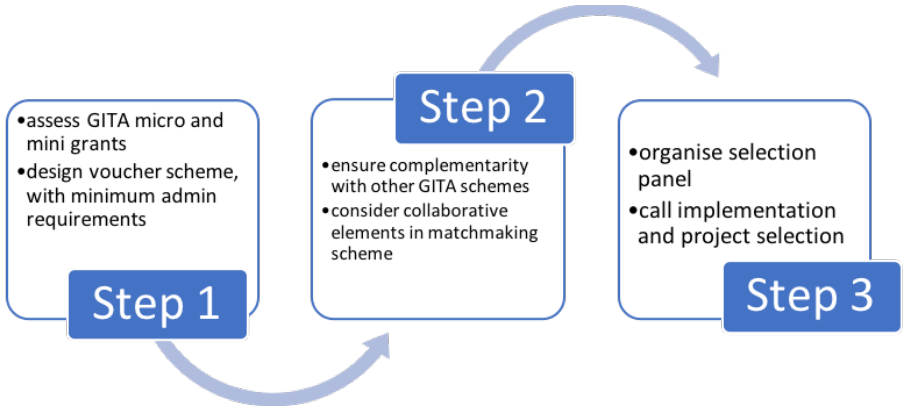
[105] Antanavičius, J., Christenko, A., Krūminas, P., Martinaitis, Ž., Paliokaitė, A., (2017). *Ex-Post* Evaluation of the Ministry of Economy Instrument Inno-Vouchers LT. Impact on Business R&D Expenditure and Summary of Final Report.

[106] Bullinger et al., (2017). Specific Support for Lithuania.

Key operational steps:

- Assess the results and impact of GITA's current micro and mini grant schemes with a focus on their R&I intensity.
- Design and introduce a voucher scheme for lowering transaction costs of starting science-business interactions, with a very low (minimum) administrative burden and limited funding (e.g. EUR 5 000). Adapt the voucher concept to national needs, but focus on SME-research-performer collaboration. When drafting the ToR for the call, keep in mind a key principle of voucher schemes: minimum administrative effort should be required for the implementation of such voucher projects. Based on experience with micro and mini grants, consider (if required) thematic priorities to avoid oversubscription of the call.
- Ensure complementarity with other GITA funding schemes, in particular the matchmaking scheme. Consider introducing collaborative elements in the matchmaking scheme, too.
- Organise a selection panel, a launch for the call and project selection.

Figure 20: Activity line for voucher scheme



5.4.3 Tax incentives

R&D tax incentives have become a major tool for promoting business R&D in the Organisation for Economic Co-operation and Development (OECD) economies. Governments in several countries seek to promote R&D investment in the economy by granting preferential tax treatment to eligible R&D expenditure, especially that incurred by firms. As of 2017, 30 of the 35 OECD countries, 21 of 28 EU countries and a number of non-OECD economies provide tax relief on R&D expenditures. Tax relief can take the form of an allowance, exemption, deduction or credit[107].

[107] OECD (2018). OECD Review of National R&D Tax Incentives and Estimates of R&D Tax Subsidy Rates, 2017. http://www.oecd.org/sti/rd-tax-stats-design-subsidy.pdf

Tax incentives are not a first-line measure in transitional economies. Some Former Soviet Union (FSU) countries have experimented with them, but have achieved only limited effect. For example, Moldova and Russia have introduced tax incentives for R&I activities. In the case of Moldova, they were viewed sceptically by the Ministry of Finance and never applied[108]. In Russia, companies do not seem to have used them either because they doubt their applicability and/or to avoid pressure from tax authorities[109]. As a result, they have been barely used by the target groups of the incentives, i.e. the companies.

Another example is Latvia. Like most R&D tax incentives, the Latvian scheme allows beneficiaries to offset allowable expenses against corporation tax (tax on company profits). Latvia's rate of corporation tax is only 15 %. At that level, the incentive is not very attractive, given the administrative complexity of obtaining it. Practical problems associated with the scheme are that it not well known among firms (especially those that do no R&D), that the firms were uncertain about exactly what type of activities are to be considered as R&D, or because the tax authorities' practice was to inspect any firm claiming the tax incentive[110].

In the framework of the Horizon 2020 PSF, a Mutual Learning Exercise (MLE) on administration and monitoring of R&D tax incentives among seven EU countries and countries associated to the Horizon 2020 was implemented in 2016[111]. Despite the limited number of participating countries, the key findings are instructive for countries interested in introducing such incentives:

- The definition of R&D is a core issue in tax incentive schemes. It can vary from country to country but is mainly based on the OECD Frascati Manual.
- The definition of eligible costs seems to be complicated in some countries and may lead to an administrative burden.
- The administration rules and practices in R&D tax incentive schemes must be understandable and user-friendly.

5.4.3.1 Recommendation 22: Tax incentives for Georgia should only be considered in the longer run

There is a general discussion at the OECD and EU level on the effectiveness of tax incentives. They are usually dependent on the local context. As tax incentives require a certain stability of the tax system and maturity of the innovation

[108] Cuciureanu, G. (2014): ERAWATCH country reports 2013: Moldova. JRC Science and Policy Reports.

[109] Spiesberger, M. (2013): ERAWATCH country reports 2012: Russian Federation.

[110] Sturn, D., Arnold, E., Borras, S., Mora Ruiz, J.-G., Reimand, I., Sinclair, P. (2018). Specific Support to Latvia. The Latvian Research Funding System, p.64f, Horizon 2020 Policy Support Facility: https://rio.jrc.ec.europa.eu/en/policy-support-facility/specific-support-latvia

[111] Uhlir, D., Straathof, B., Hambro, Ch. (2017). Administration and Monitoring of R&D tax incentives. EU Horizon 2020 Policy Support Facility. Mutual Learning Exercise (MLE): https://rio.jrc.ec.europa.eu/en/policy-support-facility/mle-administration-and-monitoring-rd-tax-incentives

ecosystem, **we do not recommend using tax incentives (tax credits, deductions, allowances) in the current situation in Georgia.** These incentives require a significant learning effort among actors in the innovation system (e.g. by the tax authorities), and companies may suspect investigations by the tax authorities and thus avoid using them. In Georgia, the low corporation tax at 15 % makes this a weak incentive which should therefore only be considered in a longer-term perspective.

The situation is different with **tax exemptions**, which are obviously required by stakeholders in Georgia, and which can be useful in certain cases. The Georgian authorities have been helpful here. The SRNSFG initiated a tax exemption for the costs of key personnel in its national and bilateral funding schemes. This initiative was supported by the MES, Ministry of Finance (MOF) and the Georgian government (as certain calls are regulated by governmental decrees).

The Georgian Tax Code currently foresees tax exemptions for national and international grants. These include exemptions from value added tax (VAT), from income tax, and from import tax (on imported goods financed with grants)[112]. Grants must be registered with the MOF to benefit from these exemptions. In reality, VAT repayments on goods purchased with grants, although foreseen in the law, are not possible. This should be resolved. There is no general VAT exemption on public research organisations, as in some other countries (e.g. Austria).

Another case concerns the co-funding of companies in the SRNSFG's applied research scheme, which poses a problem because, for the tax office, it is not an eligible cost.

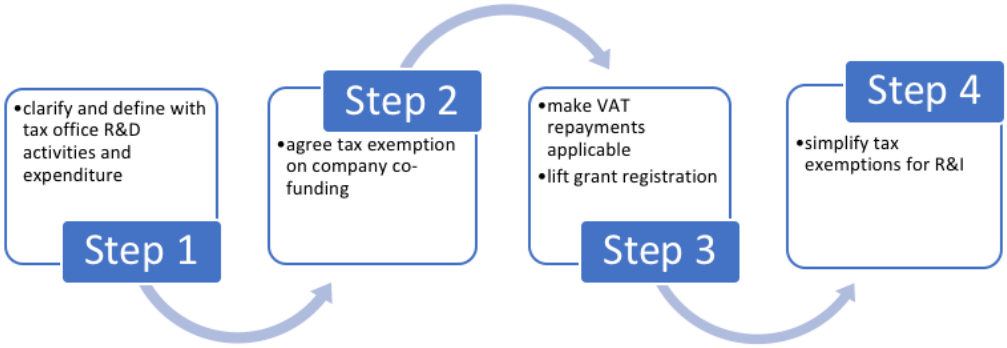
First, it would be necessary to specify with the tax office what exactly is to be understood under R&D activity and research expenditure. An exception should be agreed with tax authorities concerning co-funding in SRNSFG grants. Overall, in the long run, simplification of these tax exemptions should be considered.

Key operational steps:

- Specify with the tax office exactly what is understood by R&D activity and research expenditure.
- Agree among the MOF, MES and public R&D funding agencies on the introduction of a tax exemption on co-funding provided by companies in their funding schemes.
- VAT repayments on purchases with grants, as foreseen in the law, should be made applicable.
- In the long run, consider simplifying tax exemptions for R&I. In the short term, lift grant registration with the MOF.

[112] Information provided by SRNSFG, May 2018.

Figure 21: Activity line for tax exemptions



5.5 Exchange of people and mobility schemes

Here we focus on specific (policy) measures to facilitate the mobility of people as well as the education and training of experts who cross over the research and business domains. Several options are available to stimulate this mobility which we outline in the following sections. Personnel lacking the adequate skills has been identified as one of the problems hampering innovation activities in the business sector. Mobility measures allow for upgrading the applied research skills of human resources and companies access to scientific knowledge. This will lead to enhancing the business sector's absorptive capacities for research.

5.5.1 Creating a policy environment for staff secondments

Creating a policy framework that enables the movement of specialists from universities and research institutes to companies, and from companies to universities and research institutes, is a powerful mechanism for establishing persistent and productive relationships between research and business. The advantages of encouraging staff mobility – in either direction – mainly concern the opportunities this provides for a more comprehensive and nuanced understanding of problems and building of trust.

In the first instance, the following framework provisions need to be examined:

- **Employment contracts**. These must be sufficiently flexible to allow this kind of mobility.
- **Positive incentives**. These may include small payments to offset the disruption that mobility creates; access to unique data; access to research facilities, etc.
- **Technical provision for matching opportunities**. This kind of mobility usually works when the move presents an opportunity for all sides involved. Matching opportunities can be achieved via a webpage where companies and research groups/researchers reach out with pressing concerns and/or offers.

5.5.2 Company-funded studentships

This is a scheme whereby companies fund undergraduate and postgraduate (Masters and PhD) studentships. There are numerous examples of such schemes in the EU Member States, including:

- **Schemes coordinated by intermediaries**. In the UK, for example, apprenticeship schemes were introduced by the government. While the majority of these concern training, some, mainly in engineering, are used to fund students at undergraduate and postgraduate levels.
- **Direct approach by industry**. In this case, companies directly approach a university and agree the conditions under which they will fund several studentships.
- **Ad-hoc funding arrangements** are also possible, whereby a company supports a specific student.

5.5.3 Industrial participation in university teaching

Industry can participate in university teaching in the following ways:

- **Proposing a tailor-made course/degree** (at undergraduate and/or Masters level) whereby the company has a decisive say on the learning outcomes, syllabus and teaching approach. Naturally, the company provides the financial support for developing and running the course/degree and may, or may not, also offer studentships. This is a relatively long-term arrangement.
- **Involvement in redesigning existing courses/degrees**. This is lighter-touch industry involvement that can have a considerable effect on university teaching and training.
- **People from industry teaching on university courses/degrees**. Industry experts can either be invited to give guest lectures or can teach entire courses.
- **Offering industry placements to students**. Such placements can be organised as 'sandwich' degrees whereby undergraduate and postgraduate students spend several months to a year working in a company aligned with their degree.

5.5.4 Coordinated PhDs

This proposal is modelled on CASE studentships in the UK[113] which involve:

- Co-funding of the PhD by public funding and funding from a company.

[113] CASE studentships are offered by UK research councils, thematic R&I funding bodies, e.g. in biosciences, environmental sciences, etc. See example at: https://nerc.ukri.org/funding/available/postgrad/focused/industrial-case/

- The PhD project is defined so that students work on a practical problem experienced by the company (or the industrial sector) while meeting strict academic standards.
- Students are co-supervised by a university researcher and a representative of the industrial partner.
- Students spend some of their time at the company (and have access to data).

International practice case: Mobility schemes for human resources in Germany

In Germany, more than 200 public and private universities offer 'dual' BA/MA studies. Dual means that study phases alternate with segments of practical work in the private sector. On the base of cooperation contracts between the academic and private sectors, companies directly influence and financially support human capital fitting their economic needs. At the same time, students prepare for growing expectations and specific challenges in management positions and innovative production.

A specific state-funded programme ('Meister-BAföG') is reserved for master craftsmen who wish to upgrade their managerial or technical abilities beyond middle management[114]. Their long-term experience and training is recognised as an adequate basis for further MA studies in their professional area.

At the postgraduate level, there are a growing number of dual PhD studies in a broad range of societal and technical disciplines. Besides universities, many specialised and renowned private graduate schools are running such programmes, funded either by the state or by private companies. Decisive for such models is a decentralised approach: generally, dual PhD studies are integrated into local expertise and regional development policies.

5.5.4.1 Recommendation 23: Introduce a research-to-business fellowship scheme for PhD students.

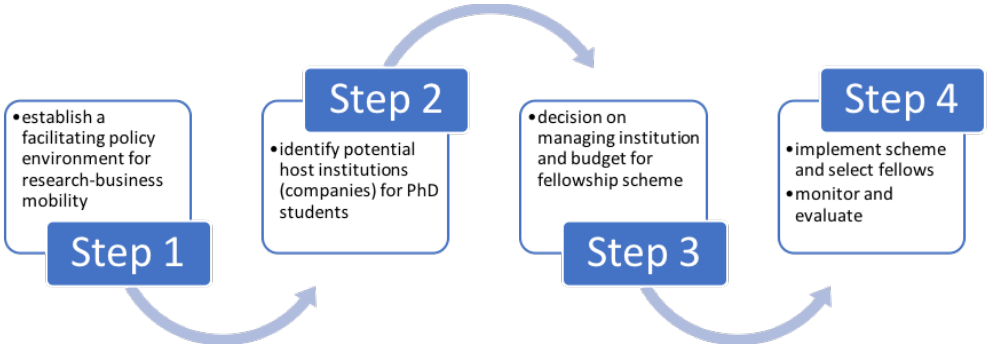
From the options outlined for the mobility of human resources, we believe that in the short term a mobility scheme for PhD students to business should be introduced. This takes into account the limited available resources whilst ensuring the stimulation of the research-business interaction. The fellowship could be modelled on the example of the coordinated PhDs, whereby both research and business organisation supervise the implementation of the PhD project and the student's study time is shared between university and company. The fellowship scheme could be implemented by the GITA building on the experience of the SRNSFG, which already has at its disposal a portfolio of fellowships for young researchers.

[114] See www.aufstiegs-bafoeg.de

Key operational steps:

- Assess the policy environment for staff secondments. It should be adapted to facilitate research-business mobility, and administrative hurdles must be removed. Where required, modify employment contracts, consider providing positive incentives, and introduce matching opportunities (e.g. via the GITA's website).
- Identify potential host institutions (companies) for PhD students and assess the potential business demand in the mobility scheme; this activity should be linked to the mapping of SBL success stories and expertise outlined above.
- The RIC secretariat will select the managing institution for the scheme, e.g. GITA, and will allocate a budget for its implementation.
- Develop the terms of reference for this fellowship scheme, consult with stakeholders and decide on the final version. Implement a call and select fellowships.
- Ensure monitoring and evaluation of the scheme's impact, and adapt it according to the evaluation results.

Figure 22: Activity line for research-business mobility



5.6 Science-business links good practice cases: company sector, institute sector

<u>Biotecsi company: how to grow a research-based company, linkages with research units, challenges</u>

The Biotecsi company[115] started up at the time of Georgia's independence at the end of the Soviet Union. Its first success was a biopreparate against rats; since then, the company has expanded into bio-pharmaceuticals for animals and to producing generics. It is currently building another plant for pharmaceuticals for

[115] Information on this good practice case is based on an interview and a company visit by the expert panel in February 2017. See also: http://biotecsi.ge/index.php?m=2

humans and has about 100 collaborators, plus an additional 20 staff at its research centre.

User requirements (mostly farmers) are well integrated in the product portfolio. This has led to an expansion of the activities beyond bio-products and pharmaceuticals to water pumps. These pumps do not require electricity and have been developed following requests from farmers.

The company has a close partnership with the Rocky company which is situated next to it and handles Biotecsi's logistics and sales. Rocky is an agronomy and biotech company and is involved in the Georgian farmers' association which numbers around 1 500 farmers. Rocky has been inviting scientists and consultancy from abroad to solve specific farmer problems.

The **Biotecsi research lab** (Biorational Technologies Research Centre) was established two years ago. The company funded the setting up of the lab itself. The lab is legally independent from the company, which gives it the freedom to pursue research activities. The lab has certification capacity and carries out quality checks on food, pharmacy, and preparates for animal diseases, including for clients from abroad. In this way it is acquiring a certain standing.

Human resources: scientists are working directly within the company and in addition research is contracted from universities and research institutes. Projects which have been financed by the company are implemented with universities. However, no joint company-research partner grants have been applied for yet. At the moment, contracting researchers for specific tasks is sufficient. In the future, such joint grants will be required because the company can no longer do some of the research on its own. There is a lack of equipment, and finance and grants will be needed to upgrade the equipment. Universities cannot do the things they need as a company; in most cases, the universities have the necessary equipment but they do not have the qualified staff required to do the work. Furthermore, in some universities there is also a lack of equipment which is available at the company.

Collaborators are recruited from various institutes and receive education at the company and research centre. Recruiting is done in Georgia and also in Ukraine. More experts from the younger generation are needed in biology and chemistry. Some colleagues from the younger generation are working at Biotecsi, for example PhDs and they are educated here.

Intermediaries: in general, there is a problem with linking intermediary support in Georgia. The idea exists but there is a gap for prototyping/samples/demonstrators. However, this is not so for Biotecsi: the company can do that and can make a final innovative product. The enhanced function of intermediaries is required: absorbing companies' market needs and looking for teams which can provide solutions. There is a low culture of associations/platforms which can channel the needs of specific sectors (e.g. tourism) to business. The farmers' association is a success factor for Biotecsi and Rocky. This association can articulate the needs/requirements of farmers and communicate these user requirements to the companies. The companies follow a profit-oriented business model: if there is demand from the market/from farmers,

market needs are taken up and research is carried out. Good practice is a way to inform companies about how to improve and which technologies to apply, thereby creating demand in innovation.

Funding: expansion of the company was financed by ProCredit Bank. Expansion of the market is planned, e.g. to Ukraine, although at the moment the market is mainly in Georgia. The company has followed an organic growth path during difficult times, based on strategic thinking.

In Georgia, business has difficulties finding money for research. There is a lack of resources for longer-term development and solving longer-term problems. New projects are planned with unique techniques. These really innovative projects pose a challenge to available staff, and it is difficult to solve the problems alone. External expertise will be required here.

IP and Sakpatenti cooperation: IP and know-how are available at Biotecsi. Some projects concern intellectual property and Sakpatenti supports the companies with this. Researchers are working in groups so it is important to specify shares of ownership and to create legal rights for the company. A company can start working when the rights are protected. At the moment, intellectual property is protected in Georgia so there is no need yet to protect it abroad.

Conclusions/lessons learned from the case: the company's success is obviously strongly linked to the client base and to the take-up of their requirements. Strategic development has paid off in difficult economic conditions.

Education of the young generation, awareness raising about innovation among the business community and digitalisation are key issues from the company's point of view. Cooperation with Sakpatenti has proved fruitful for the company, by supporting its IP issues.

Eliava institute: a research institute successfully developing innovation activities

The George Eliava Institute of Bacteriophage, Microbiology and Virology[116] was established in its current form in 1998, based on an institute founded in 1923. It has navigated through the difficult times of independence in Georgia and managed to secure knowledge and expand its activities in innovation. Today, it has around 120 staff.

Business cooperation: Eliava is an independent state research institute in the applied research area. A US grant from the Civilian Research and Development Foundation and the Department of State's 'Bio engagement programme', has helped to develop Eliava's commercialisation activities. The current business model was developed on this basis of advice for which an advisory board proved particularly helpful. US colleagues had the idea of establishing a foundation –

[116] See http://www.eliava-institute.org/

staff at the institute founded it and other spin-offs/companies are operating within the foundation. The company is based on a production unit which still exists from Soviet times. A phage therapy centre and media production were funded by the US Departments of State and Defense. A pharmacy and management group were also established. Eliava could not found spin-offs directly as governmental organisations are subject to restrictions because of legislation.

Since there is an interest in working with business beyond Eliava, a commercialisation and cooperation team has been installed. Cooperation mainly takes place with foreign companies: product-oriented R&D, medical field, cooperation with pharma. Dairy-production-related work is also performed; cooperation with dairy companies concerns food safety. Another example is chicken farms where phages are used to help cure illnesses. But there are fields beyond phages. Interaction with companies is not obvious for researchers, so a strong team/unit is required to work with them.

Georgia's support structures for SBL and Eliava: the GITA has offered to help several times but this has yet to be taken up by the institute. GITA proposed a science festival for kids, but that was not suitable for the institute. Colleagues have heard of Enterprise Georgia but have not used it yet. Having heard that it is a good programme, many companies have used it, particularly small enterprises. Sakpatenti is helping too, and it provides a useful service. Business brokers are needed. The institute has had bad experience with US companies which wanted to take its IP.

Link to HEIs: the institute has traditionally very good relations with universities. Students want to come to Eliava because it is very well known. Studying is possible, and going abroad is easier with experience at the institute. Eliava has better labs than the HEIs, and the institute staff teach at the medical university. PhD students are working at Eliava and there are memorandums of understanding with HEIs. Eliava colleagues are not staff members at HEIs but teach there on a contractual basis. Lab courses can take place at Eliava but they are remunerated differently.

Funding: basic funding is less than 20 %, a proportion which changes from year to year. Other income is from grant competitions. GEL 650 000 (EUR 240 000) per year is the block grant for salary and building maintenance, but it cannot be used for consumables. These must be covered by grants. Staff are also working part-time in companies; others are doing teaching activities. Teaching is also foreseen in the training centre, when it opens. Grant support is the only possible way to do research. The Eliava Foundation was established 10 years ago, but this is the first time an internal competition can be implemented – five projects will be financed with GEL 8 000 (EUR 2 095) for a period of 6 months. This investment has to be seen as seed money. The Foundation also finances conferences, fundamental grants and grants for young researchers, which are very much appreciated.

Infrastructure: bacteriophage and strain collection is a valuable resource which should be expanded further and on an international scale. However, infrastructure support is needed from the government.

Conclusions/lessons learned: the institute has successfully managed to utilise its research expertise for innovation activities. The innovation income reciprocally helps fund research activities. A foundation has become instrumental in channelling back resources to the institutes research base in a model which might be instructive for other research institutes, too.

ANNEX 1: TERMS OF REFERENCE

Terms of Reference: Purpose, scope and objectives of the Specific Support to Georgia

The objective of the PSF specific support to Georgia is to provide tailored advice and concrete recommendations to the Georgian authorities linked to the implementation of three selected issues (stemming from the Policy Mix Peer Review – PMPR - recommendations and chosen by the Georgian authorities):

(1) Support in identification of promising research fields

(2) Measures for narrowing the gap between research and industry/business

(3) Proposal for the performance-based funding of research entities

More detailed background explanation of the focus areas:

(1) Support in identification of promising research fields

Relevant extract from the 2015 PMPR:

"*The definition of sound priority fields for research is a major concern and challenge in most of the countries worldwide, since all fields of research can claim their necessity with valuable arguments (for educational reasons; for future emerging applications or threats as, for example, when the Bird flu epidemic occurred highlighting the role of ornithologists). Keeping this in mind, it is not surprising that a recent attempt to define priority fields for research in Georgia, resulted in as much as 84 priorities, according to information given to the Panel. On the other hand the limited resources and funding makes choices unavoidable in most of the countries including the most developed ones.*

In Georgia, given the significant decline of the STI system over the last decades and the reduced research personnel and capabilities in most of the research fields to a minimal/baseline level, any attempt to define priority fields should take the form of a positive discrimination, i.e. as a field for stronger investment and not as a threat for further decreasing the research personnel or closing laboratories. In other words, the current level of GERD of 0.2% of GDP, which can hardly maintain the STI system functioning, needs certainly to generously increase but this increase should be well thought and oriented/concentrated mainly on priority fields of major economic and social impact for the country in the context of the national vision and strategy.

The definition of the priority fields could include two distinct types of fields:

> *(Rec 7)* ***Research fields where currently strong research capacity exists*** *e.g. around best practice examples/infrastructures in the country such as the R.G. Lugar Center for Public Health Research, the Bacteriophage Institute, or support traditional research fields such as Georgian studies and a few other in which a comparative advantage may exist.*

(Rec 8) ***Research fields that centered around promising economic fields (niches) in the country****, e.g. Wine industry and other Food products with specific added value; Tourism and other services; etc.*

Identifying priority research fields should be considered as an urgent Governmental task since investing in such fields will create poles with critical mass towards which the currently strongly scattered '84'research orientations and the business sector of the country will converge generating inter-disciplinary approaches and cluster structures with promising potential. ***Such investment should take the form of competitive grant schemes involving industry – academia cooperation (collaborative research), as well as well-thought infrastructure development.***

Therefore **the first aim of the specific support activity would be to assist Georgia in the process of identifying the research priorities**, based on available analysis of innovation potential, consultation process (discussions with various stakeholders), bibliographic and other data (UN, WB) helpful to detect the areas of greatest relevance for Georgian research capacity and economic development. The PSF will provide methodological support, guidance material, evidence-based analysis and good practice examples which would constitute the building blocks for the identification process.

Georgia admits that the current 84 'priorities' do not allow making e.g. funding choices and seek advice on prioritisation process. Providing concrete analytical support to Georgia in identifying the research capacity as well as the promising economic fields would be beneficial for definition of sectors to be addressed in priority by the national programs but also as priorities for participation in Horizon 2020. Of course the aim of this specific support is not to replace the bottom-up 'smart specialisation' process which must be interactive, regionally-driven and consensus-based.

To note: This focus area is strictly linked with the following one, on linking research and business.

See recommendation 34 on "*defining* ***priority research fields that have a positive impact on dynamic economic sectors of the country"****.*

(2) Measures for narrowing the gap between research and industry/business.

Relevant extract from the 2015 PMPR:

"Chapter 4 – Innovation and business sector

Strengthening innovation is highly positioned in the political agenda in Georgia: a chapter dedicated to 'Innovation and technology' is included in the Socio-economic Development Strategy of Georgia 'Georgia 2020'; the RIC has been established; a Law on Innovation is under preparation; specific structures are established (GITA, EDA, etc.). In that context, positive concrete initiatives have been undertaken: setting-up of FabLabs and iLabs, development of a Technological Park, etc.

At the same time however, the patenting activity is stagnant if not dropping. Moreover, when looking closer to the innovation related activities the focus seems to be on low-tech innovation while knowledge intensive innovation arising from the business-research cooperation is lagging behind. This fact is the result on the one hand of the pressing demand of rapid results that will impact to the economy at short term and, on the other hand, of the gap that exists between business and research centres/universities. Both sides share the responsibility for this gap: the emergence of new active business sectors in the country with limited absorption capacity for research, and the isolation of the research sector which for 'historical' reasons deserved a research demand outside of the limits of Georgia, which does not exist anymore.

When considered the aforementioned context the Panel recommends:

> *(Rec 34) To **define priority research fields that have a positive impact on dynamic economic sectors of the country**. Such fields with potentially high economic impact could include e.g. wine and traditional foods; services, including tourism; etc. The principles of the Research and Innovation Strategy for Smart Specialization (RIS3) can constitute a valuable guideline for the definition of such fields.*
>
> *(Rec 35) To bring closer the business sector to universities and research centres by **involving business sector representatives in Advisory boards of Universities and research centres**.*
>
> *(Rec 36) To **promote the use of the developed new knowledge in the economy** through licensing, patenting, etc., exploiting the public investment in the sector. In order to create a patenting culture it is recommended to provide training and to adapt wherever necessary the legislation for the universities. In addition, to promote the establishment of Technology Transfer Offices in the Universities (and to the merged research centres).*
>
> *(Rec 37) To **promote the development of dedicated support structures to facilitate the utilization of research results** (start-up support, etc.).*
>
> *(Rec 38) To **stimulate the research demand through incentives to the business sector** (tax reductions; bank loans; etc.). There is a wide variety of such incentive schemes across Europe from which Georgia can adapt the most suitable for its needs. For example, enterprises could sponsor teaching institutes (for Business Administration, Marketing, Management, etc.) or research facilities.*
>
> *(Rec 39) To **invest in parallel to the development of skills in technology adoption/absorption** as an intermediate step before sufficient maturity for innovation in the business sector arises."*

For instance with regard to complement the funding or support portfolio, a <u>good practice example</u> in the Republic of Serbia is the establishment of the Innovation Fund with support from the European Commission and the World Bank, institutions also very present in Georgia"

Therefore the **second aim of the specific support activity would be to assist Georgia in fostering business R&I, strengthening science-business links**,

building-up and enhancing knowledge transfer policies and instruments, including evaluation of current legislation and introducing tailored support measures and incentives for attracting industry and in particular the SMEs to collaborate with public research organisations.

(3) Proposal for the performance-based funding of research entities

Relevant extract from the 2015 PMPR:

"2.2 Core funding increase: Introduction of performance indicators

Currently the core funding seems not linked to a specific monitoring or assessment system for either the research entities or the researchers themselves. Certainly the actual very low (and often unsecured) level of funding of the research entities makes such systems obsolete. However, in the context of a national vision and strategy that will re-confirm the role of the STI system and will allocate additional funds to it, the gradual introduction of such evaluation systems will become important. In that respect the Panel recommends:

> *(Rec 15)In parallel to any increase of the level of the core funding for the STI system,* ***to gradually introduce monitoring and evaluation (assessment) systems****. Such evaluation systems could be based on performance indicators (e.g. quality publications; commercialization efforts; attraction of national and international funds; etc.) or even of performance contracts with the funded entities defining ex-ante the targets within a specific contracting period (3-5 years).* [117] *"*

Therefore **the third focus of the specific support to Georgia will be advice on the development of the evaluation system and performance-based funding of research entities** in the context of the review of STI financial schemes and outputs, aiming to elaborate the sound financial and impact monitoring mechanism.

The research system would profit from a higher concentration of resources and the rewarding of high performance in research. The advice on the 'pilot' evaluation methodology should be based on relevant practices from other countries but remain duly tailored and adapted to the local environment in order to allow for an objective evaluation of the quality of the scientific activities.

By using the evaluation and monitoring system and in relation to the focus area 2 (above) it could be considered to advise, for instance, on how to incentivise public research to collaborate with industry (i.e. indicators on socio-economic value of research, third-party collaborations or external funding from third parties).

The gradual introduction of agreed performance indicators, following relevant European examples and taking into account the overall context of the Georgian STI

[117] References to core funding models can be found on: http://ec.europa.eu/invest-in-research/pdf/download_en/external_funding_final_report.pdf. See also the European University Association (EUA).

system (and level of funding), could provide incentives for improving research performance and concentrate resources in the best performing organisations.

The project shall start with an assessment of the present situation in Georgia concerning these three aspects, analysing the existing practices and in particular provide concrete recommendations on how to implement necessary changes.

The main outcome expected from the specific support activity will be a report providing tailored advice and recommendations on the implementation of the above-mentioned issues.

ANNEX 2: AGENDA OF MEETINGS, DECEMBER 2017

Specific Support to Georgia:

Horizon 2020 Policy Support Facility mission (1)

Mission dates: December 4-7, 2017

Agenda

Monday, December 4, 2017

Time	Meeting	Venue
13:00 – 14:00	Dr. Mikheil Chkhenkeli, Minister of Education and Science of Georgia Dr. Alexander Tevzadze, Deputy Minister of Education and Science of Georgia	Ministry of Education and Science of Georgia Address: #52 Dimitri Uznadze Str., Tbilisi, Georgia
15:00 – 17:00	Meeting with Rectors of Major State Research Universities of Georgia: - Ivane Javakhishvili Tbilisi State University Dr. George Sharvashidze, Rector, - Ilia State University Dr. Giga Zedania, Rector, - Georgian Technical University Dr. Archil Prangishvili - Tbilisi State Medical University Dr. Zurab Vadachkoria, Rector, - Sokhumi State University Dr. Zurab Khonelidze, Rector - Akaki Tsereteli State University Dr. George Ghavtadze - Shota Meskhia State Teaching University of Zugdidi Dr. Tea Khupenia	Ivane Javakhishvili Tbilisi State University Address: #1 Chavchavadze ave. Room #107

	- Batumi Shota Rustaveli State University Dr. Natia Tsiklashvili - Samtskhe-Javakheti State University Merab Beridze/Maka Kachkachishvili-Beridze	
17:30 – 18:30	Meeting with representatives of MoES, SRNSFG and the delegationn of the European Union to Georgia: Mr. Kakha Khandolishvili, Ms.Natia Gabitashvili, Ms. Manana Mikaberidze, Dr. Nino Gachechiladze, Dr. Ekaterine Kldiashvili, Ms. Mariam Keburia Ms. Nika Kochishvili	Shota Rustaveli National Science Foundation of Georgia, Address: # 1 Aleksidze Street, III floor, Conference Hall
18:30 – 22:00	Dinner hosted by SRNSFG	Restaurant Tsiskvili

Tuesday, December 5, 2017

Time	Meeting	Venue
9:00 – 11:00	Meeting with the SRNSFG Grant holders a) Basic research, Applied research, DI b) STCU, MG, CNR, CNRS	Shota Rustaveli National Science Foundation of Georgia, Address: # 1 Aleksidze Street, III floor, Conference Hall
11:00 – 13:00	Meeting with the experts of the SRNSFG calls	Shota Rustaveli National Science Foundation of Georgia,

		Address: # 1 Aleksidze Street, III floor, Conference Hall
13:00 – 14:00	Lunch	
16:00 – 17:30	Meeting with the representatives of private universities of Georgia - Free University of Tbilisi - International Black Sea University - New Vision University - GIPA - Caucasus University - Georgian Aviation University	Shota Rustaveli National Science Foundation of Georgia, Address: # 1 Aleksidze Street, III floor, Conference Hall

Wednesday, December 6, 2017

Time	Meeting	Venue
9:00 – 11:00	Meeting with representatives of the research teams from different research institutes - Dr. Vladimer Elisashvili research team (Agricultural University of Georgia) - Dr. Ramaz Katsarava research team (Agricultural University of Georgia) Dr. Davit Mikeladze (Ilia State University) - Dr. Gia Japaridze (GNAS) - Dr. Tea Godoladze (Ilia State University) - Dr. Maya Todua (Ilia State University) - Dr. Guram Aleksidze, President of Georgian Academy of Agricultural Sciences (tbc)	Shota Rustaveli National Science Foundation of Georgia, Address: # 1 Aleksidze Street, III floor, Conference Hall
11:00 – 12:30	Meeting with grant holders – SRNSFG **Young Researchers Development Programmes** (Postdocs, PhD Fellowship winners, Master's research project call winners)	Shota Rustaveli National Science Foundation of Georgia,

		Address: # 1 Aleksidze Street, III floor, onference Hall
12:30 – 14:00	Lunch	
14:00 – 15:30	Meeting with the research performing legal entities of public law and the National Museum of Georgia -Dr. Mzia Kutateladze, Director, George Eliava Institute of Bacteriophages, Microbiology and Virology -Dr. David Nadareishvili, Ivane Beritashvili Center for Experimental Bio-Medicine -Dr. Zaza Abashidze, Director (tbc) Georgian National Center for Manuscripts -Dr. Paata Imnadze National Center for Disease Control -Dr. David Lordkipanidze Georgian National Museum	Shota Rustaveli National Science Foundation of Georgia, Address: # 1 Aleksidze Street, III floor, Conference Hall
16:00–17:00	**Meeting with the representatives of different SME and Business-related sector** - Georgia's Innovation and Technology Agency (GITA)	Georgia's Innovation and Technology Agency (GITA) Address: #7 Innovation Street, Tbilisi

Mr Georgi Zvidadze, Chairman, Ms. Mariam Lashkhi, Head of international relations department

- National Intellectual Property Center - SAKPATENTI
  Mr. Merab Kutsia – Head of the department of Inventions and new Varieties of breeds
- STARTUP Georgia
  Mr. Vazha Menabde, Director
- Enterprise Georgia

Thursday, December 7, 2017

Time	Meeting	Venue
10:00 – 11:00	Meeting with the high level representatives of the Ministry of Economy and Sustainable Development of Georgia . Mr Georgi Cherkhizishvili, and Georgia's Innovation and Technology Agency (GITA), Ms. Salome Khachiarui, Intellectual Property and Commercialization Manager	Ministry of Economy and Sustainable Development of Georgia Address: #10 a Chovelidze str, Tbilisi
12:00 – 13:00	Meeting with the Georgian Chamber Of Commerce And Industry (GCCI) and private banking sector representatives; - Ms. Nato Chikovani, GCCI deputy Director General; - ProCredit Bank - TBC Bank - Bank of Georgia	Shota Rustaveli National Science Foundation of Georgia, Address: # 1 Aleksidze Street, III floor, Conference Hall

13:00 – 14:00	Lunch	
14:30 – 15:30	Meeting with the representatives of the International Organizations in Georgia - USAID/Georgia - Millenium Challenge - Georgia	Shota Rustaveli National Science Foundation of Georgia, Address: # 1 Aleksidze Street, III floor, Conference Hall
16:00	Wrap up and planning of the next mission	Ministry of Education and Science (tbc)

ANNEX 3: PROCUREMENT PROBLEMS IN GEORGIA

Specific challenges and solutions for the procurement procedures have been identified by the SRNSFG board. They should be addressed to reduce the administrative burden on research:

Problems related to the state procurement procedures concerning the SRNSFG grants:

- Procurement applied for publishing articles in international journals;
- Purchasing computers through consolidated tender;
- State procurement of expedition services;
- State procurement of translation services;
- State procurement of chemical reagents (NAPRs, research centres);
- Procurement of cheap and low quality technologies;
- Online purchases.

Solution to the procurement problems in the SRNSFG grants:

- Support from the Ministry on the distinguished purchasing rights from the consolidated tenders;
- Support from the Ministry in communication with the State Procurement Agency regarding the amendments in the regulations;
- Trainings for the grantees on the state procurement issues.

Offers/possible solutions (SRNSFG grantees point of view)

- To increase the monetary thresholds in the simplified procurement in the terms of the grants;
- A government decree on CPV Codes (Common Procurement Vocabulary) defines the procurement objects, which need the approval of the Georgian government. This decree should not apply to the Legal Entities under Public Law (LEPLs – public research organisations are usually organised as LEPL);
- Procurements in the frame of grants should be implemented only through simplified procurement;
- The state procurement law should not apply to publishing of scientific articles. The terms of public grants (e.g. by SRNSFG, GITA) should be modified accordingly;
- Each grant should be foreseen as a separate funding source. This would allow Georgian research institutions to purchase materials with the simplified method of procurement. Simplified procurement is used for procurement of similar objects with a value of up to GEL 5 000 (EUR 1 700).

ANNEX 4: OVERVIEW OF RECOMMENDATIONS

Recommendation No.	Recommendation	Primary stakeholder to take up the recommendation
	Chapter 2: Overarching issues	
1	**Increase the funding for research and innovation**	MES/ MOESD/ restructured RIC
2	**Overcome the bureaucracy and ease off the administrative burden for research and innovation**	MES/ MOESD
	Chapter 3: Prioritisation in research and innovation	
3	Restructure RIC to become a functioning strategic actor in the Georgian STIS	Prime Minister Office/ MES/ MOESD
4	Initiate a dedicated, nation-wide, project on designing and implementing an information system for Georgia	MES/ MOESD/ GEOSTAT
5	Establish a Small Number of National R&I Centres	MES
6	Align priorities for research and innovation to strategic economic priorities	restructured RIC
7	Develop consistent and transparent criteria for the selection of priority research and innovation fields/areas	MES/ MOESD
8	Apply reliable methodology for priority selection	MES/ MOESD
9	Design a meaningful and transparent priority decision-making process, including a broad stakeholder consultation.	MES/ MOESD
10	Implement priorities through funding and positive incentives.	MES/ MOESD
	Chapter 4: Performance based research funding	
11	Introduce base-line funding to public research organisations and create a level playing field.	MES/ SRNSFG
12	Fully integrate Research Institutes in the universities	MES
13	Upgrade the research infrastructure	MES
14	Allocate responsibilities for managing PRFS	MES/ restructured RIC
15	Establish a R&I system database	MES/ MOESD/ SRNSFG/ GITA
16	In terms of methodology combine metrics and peer review for performance measurement.	MES
	Chapter 5: Science-Business Links (SBL)	
17	Establish a network of brokers and a related back office for technology transfer and science-business cooperation	GITA
18	Provide clear and simple rules and advice for researchers active in SBL.	SRNSFG/ GITA
19	Ensure that a favourable IPR regime is widely implemented and will facilitate research-business cooperation and technology transfer.	MES
20	Introduce Competence Centres as instrument for applied and collaborative research, and for regional development.	MOESD/ MES/ GITA
21	Tune R&I funding portfolio towards collaborative R&D - modify SRNSFG applied research scheme and introduce Innovation Vouchers.	SRNSFG/ GITA/ Enterprise Georgia
22	Tax incentives should only be considered in the longer run for Georgia	MES/ MOESD/ MOF/ Tax office
23	Introduce a research to business fellowship scheme for PhD students.	MOESD/ MES/ GITA/ SRNSFG

ANNEX 5: ACTION PLAN – TIMING OF RECOMMENDATIONS

Recommendation No.	Recommendation	Implementation suitable/feasible at	
	short term	**mid term**	**long term**
	Chapter 2: Overarching issues		
1		**Increase the funding for research and innovation**	
2	**Overcome the bureaucracy and ease off the administrative burden for research and innovation**		
	Chapter 3: Prioritisation in research and innovation		
3	Restructure RIC to become a functioning strategic actor in the Georgian STIPS		
4	designing and implementing an information system for Georgia		
5		Establish a Small Number of National R&I Centres	
6		Align priorities for research and innovation to strategic economic priorities	
7		Develop consistent and transparent criteria for the selection of priority research and innovation fields/areas	
8		Apply reliable methodology for priority selection	
9			Design a meaningful and transparent priority decision-making process, including a broad stakeholder consultation.
10			Implement priorities through funding and positive incentives.

Recommendation No.	Recommendation	Implementation suitable/feasible at		
	short term	mid term	long term	
	Chapter 4: Performance based research funding			
11	Introduce base-line funding to public research organisations and create a level playing field.			
12	Fully integrate Research Institutes in the universities			
13			Upgrade the research infrastructure	
14	Allocate responsibilities for managing PRFS			
15	Establish a R&I system database			
16		In terms of methodology combine metrics and peer review for performance measurement.		
	Chapter 5: Science-Business Links (SBL)			
17		Establish a network of brokers and a related back office for technology transfer and science-business cooperation		
18	Provide clear and simple rules and advice for researchers active in SBL.			
19	Ensure that a favourable IPR regime is widely implemented and will facilitate research-business cooperation and technology transfer.			
20		Introduce Competence Centres as instrument for applied and collaborative research, and for regional development.		
21	Tune R&I funding portfolio towards collaborative R&D - modify SRNSFG applied research scheme and introduce Innovation Vouchers.			
22		Tax incentives should only be considered in the longer run for Georgia		
23		Introduce a research to business fellowship scheme for PhD students.		

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The Horizon 2020 Policy Support Facility (PSF), set up by the Directorate-General for Research and Innovation (DG RTD) of the European Commission under the EU Framework Programme for Research and Innovation, supports Member States and countries associated to Horizon 2020 in reforming their national science, technology and innovation systems.

The aim of the PSF Specific Support for Georgia, carried out by a panel of independent European R&I policy experts from October 2017 to May 2018, was to provide tailored advice and concrete recommendations on reforms necessary to improve and strengthen country's research and innovation system in three specific areas requested by the Georgian government.

This final report of the PSF Specific Support for Georgia, provides an overview of the key challenges and opportunities of the Georgian Science, Technology and Innovation System (STIS) and puts forward suggestions for improving its effectiveness through prioritisation, selectivity of funding and science-business links.

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