



Background document Lithuania

Document prepared for the Lithuania's peer review

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Introduction and objective of the peer review exercise in Lithuania

What is a peer-review and the role of a background document?

This document constitutes the first step of the Lithuania's peer review, which is a learning exercise part of the Manumix project.

Peer reviews can take different approaches, as explained by Nauwelaers (2015), from which OECD and EU peer reviews can be highlighted, mostly focused at the national level. In addition, peer reviews at the regional level have been pushed in the last years by both the Interreg programme and the Joint Research Centre (S3 Platform), the latter focused on Smart Specialisation Strategies. Some peer reviews are very intense in time and are proposed to answer a narrow question, while others focus on more broad aspects. This is the case of this exercise within the Manumix project.

The objective of a peer review exercise is not transferring good practices from peers, but to enlighten a process of policy learning. It is important not to forget that in (regional) innovation policies there is not a single recipe or 'one size doesn't fit all' (Tödtling and Tripl, 2005) so the recommendations from peer reviews have to be contextualized in the territory after the process has finished.

Generally, three phases can be distinguished in a peer review exercise:

1. Preparation: This phase includes the elaboration of previous material or documentation. This could include a background document, elaborated either by the peered region or by an external expert. The objective of this document is to inform the peers about the policy or issue which will be the focus of the peer review exercise, not to do an analysis or provide with solutions to the peered territory. In addition, this phase includes the mobilization of the resources needed for the peer review, which are the persons that will take part in the implementation phase from both the peered and the peers.
2. Implementation: This is the phase in which the analysis of the background documentation from the peers and the interactions among the peered, the peers and the external expert (if any) take place. This phase varies depending of the format of the peer review exercise. It could take a year or a month and of course the result and in-depth analysis resulting from the exercise varies depending of this format. It normally includes meetings among the participants of the peer review, but also workshops are an option for the implementation.
3. Incorporation: This includes the dissemination of the results of the exercise as well as defining the next steps that the peer region will follow after a consequence of the exercise.

Objective of the Peer Review for Lithuania and methodological steps

Lithuania has set as a goal for the peer-review to get recommendations that are useful for *proper design of innovation policy (proper policy-mix), and, at the same time, developing intervention logic of innovation policy that matched more closely the needs of stakeholders and, in particular, of the beneficiaries.*

Lithuanian team that participates in the Manumix project considers this exercise important as Lithuania faces major challenges in formulating appropriate policies for promoting and implementing innovation.

The key issues formulated in the Open Call document for the Manumix peer reviews by MOSTA are the following:

- 1) Formulated policy instruments are not responding properly to the time aspect (policy formulation and design stage takes too long); the relevance of the policy instruments is lost in the policy formation stage, it becomes difficult for businesses and research institutions to meet the requirements and accumulate the necessary investments;

- 2) Investing in innovation policy is risky; policy makers usually pose unreasonable expectations to results of the projects of potential policy-makers;
- 3) Policy instruments are financed by the European Union funds, due to this reason a lot of additional stringent requirements are added for policy instruments that are unfavourable to the beneficiaries;
- 4) In the case of commercialization, policy makers do not take into account the resources and time needed for this stage, which results in unprovoked requirements for project results that make policy instruments unattractive to potential beneficiaries;
- 5) Significant administrative burden when applying for project support;
- 6) Lithuania's innovation sector lacks foreign capital investment; policy instruments are not suitable for foreign companies and foreign research institutions;
- 7) The design of policy tools lacks the aspect of project continuity assessment; lack of tiered funding, policy integrity;
- 8) There is a lack of timely public hearings during the design of policy tools.

Given the scope of the topic proposed and the challenges implicit to it, the peer review process will constitute a starting point for the design and implementation of more adequate policy-mixes given the Lithuanian context, which will be developed further through the action plan.

Concretely, the following steps are proposed for the peer review exercise:

1. Preparation: this background document and the information prepared for the second Learning Journey held in Turin in November 2017, policy documents as well as academic publications about Lithuania constitute the main sources of information as well as the baseline document and other sources used in the project;
2. Implementation: from March until the face-to face meeting, which will be held in April 17-18 in Vilnius, the peer regions (Basque Country and Wales, in this case) and the peered region (Lithuania) together with the Advisory partner (Orkestra) will review the documentation to get the knowledge needed for the face-to face meeting. This meeting will be composed of two different elements: presentations from relevant people in the peered region (responsible for the policy-mix in Ministry of Education and Science, Central Project Management Agency (CPMA), Agency for Science, Innovation and Technology (MITA), Lithuanian Innovation Center (LIC), and Vilnius University) followed by my reflections and inputs from the peers.
3. Incorporation: during this phase, a report that incorporates the results of phase 2 will be produced and that will constitute an input for dissemination in the peer region as well as an input for the action plan that the peered region must deliver for the Manumix project.

Main concepts for understanding the scope of the peer review

In this section some of the most important concepts that will be useful for the scope of the peer review are highlighted:

Innovation policy-mix

Innovation policy-mix could be defined as *“the combination of policy instruments, which interact to influence the quantity and quality of R&D investments in public and private sectors”* Nauwealers (2009). In this definition, two main elements could be highlighted: the concept of instrument and the concept of interactions or combination. Therefore, policy instruments can be defined as *(t)he actual means and or*

devices governments have at their disposal for implementing policies, and among which they must select in formulating a policy (Howlett and Ramesh, 2003). Examples of instruments are subsidies, loans, cluster policy, etc. and can be articulated through programmes. In the case of innovation policy mixes for a concrete strategy, such as Advanced Manufacturing, two characteristics have to be taken into account: the verticality of policy-mixes (instruments and mixes from different administrative levels) and the directionality of policy-mixes (whether they are neutral instruments or directed towards a specific priority). Summarising, innovation policy mix is much more than a set of a portfolio of instruments as it must take into account instruments interactions.

Instruments interactions

Different instruments interactions can be highlighted in the context of policy-mixes. According to Figure 1, there are five types of interactions that need to consider: precondition, facilitation, synergy, potential contradiction and contradiction. These interactions should be taken into account in the design and implementation of instruments and policy-mixes.

Figure 1: Types of interactions for policy-mixes

Table 1. Five types of relations among policy measures.

Relation	Description
Precondition (P)	Defined as a relation that is strictly required for the successful implementation of another policy measure. For instance, if policy measure B is a precondition to policy measure A, the successful implementation of policy measure A can only be achieved if policy measure B is successfully implemented beforehand. The precondition relation is a direct relation.
Facilitation (F)	In a case where a policy measure 'will work better' if the outcome of another policy measure has been achieved, the relation is considered as a facilitation relation. For instance, policy measure B facilitates policy measure A when policy measure A works better after policy measure B has been implemented; however, policy measure A could still be implemented independently of policy measure B. The facilitation relation is also a direct relation.
Synergy (S)	A special case of facilitation relation in which the 'will work better' relation is bidirectional (undirected relation). It can be argued that such a relation can be treated as a two-way facilitation; however, we believe that treating this relation as a separate type is advantageous, as it suggests a higher effectiveness of both of the policy measures having the synergetic relation vis-à-vis the overall policy.
Potential contradiction (PC)	A potential contradiction exists between policy measures if the policy measures produce conflicting outcomes or incentives with respect to the policy target under certain circumstances, hence the contradiction is 'potential'. This relation is undirected.
Contradiction (C)	In contrast to the conditional nature of potential contradiction, the contradiction relation is defined when there are 'strictly' conflicting outcomes of incentives between policy measures. Similar to the potential contradiction relation, this relation is undirected.

Source: Tæihag et al. 2013.

Policy instruments and typology for innovation policy

As mentioned above, policy instruments or tools can be defined as "the actual means and or devices governments have at their disposal for implementing policies, and among which, they must select in formulating policy" (Howlett and Ramesh, 2003).

In the literature there are several taxonomies or classifications of policy instruments in general and innovation policy instruments in particular. Generally, we could differentiate between regulatory instruments, economic or financial instruments and soft instruments (Bemelmans-Vidéc et al., 2003;

Borrás 2009). Regulatory instruments refer to legal and binding regulations, such as the regulation of intellectual property rights or competition policy, etc. Economic and financial instruments are the most commonly implemented in some policy arenas, such as STI (Borrás; 2009), examples being tax incentives, grants, loans, etc. Soft instruments are voluntary and non-coercive measures that provide information and recommendations and offer contractual agreements; the most commonly used are the international or national standards, partnership agreements and public communications.

In the innovation policy arena, we can find different taxonomies. From a simplistic and dichotomist view we could distinguish between supply side instruments such as grants and loans for R&D tax incentives, support for research infrastructures and demand-side instruments (i.e. innovative public procurement). More exhaustive taxonomies can be found in the literature such as the one provided by the European Commission (2013), which gives an exhaustive list of policy instruments according to different objectives or the typologies provided by the OECD (2011) and Foray et al. (2012). Magro and Nauwelaers (2015) built on Nauwelaers and Wintjes (2002) and give a classification of instruments for territorial strategies depending on their target group (firms vs. system oriented) and whether they are oriented towards thematic priorities (i.e. Advanced Manufacturing) or horizontal ones.

Table 1: Taxonomy of instruments for territorial strategies

Target of support	Thematic priorities	Functional priorities
Firm oriented	R&D grants for firms in specific sectors Investment in sectoral-based knowledge infrastructures Public procurement for innovation focused on specific sectors	Training and mobility programmes Science parks Incubators Innovation Vouchers
System oriented	Cooperative schemes research-industry Cluster policies Network policies	Training and mobility programmes between industry and academia

Source: Taken from Magro and Nauwelaers (2015)

The choice of policy instruments and policy-mixes

The types of policy instruments, which are available for innovation is widely covered in documents from international organisations (OECD, 2011; Foray et al., 2012, European Commission, 2013), although there is little reflection about how these instruments could be combined in practice, especially given the fact that there is not a recipe valid for all the territories and that the policy-mix composition should be context specific (Magro and Nauwelaers, 2015). These authors also highlight other factors affecting instruments choice such as:

- Complexity and non-linearity of one instrument-one goal, as a goal could be addressed by various instruments and on the other way around an instrument can contribute to reaching several goals;
- Technical understanding of policy instruments usually doesn't lead to effective results as political issues can show up. Sometimes the most suitable instrument is not implemented because it is not the optimal from a political point of view (Peters, 2005);

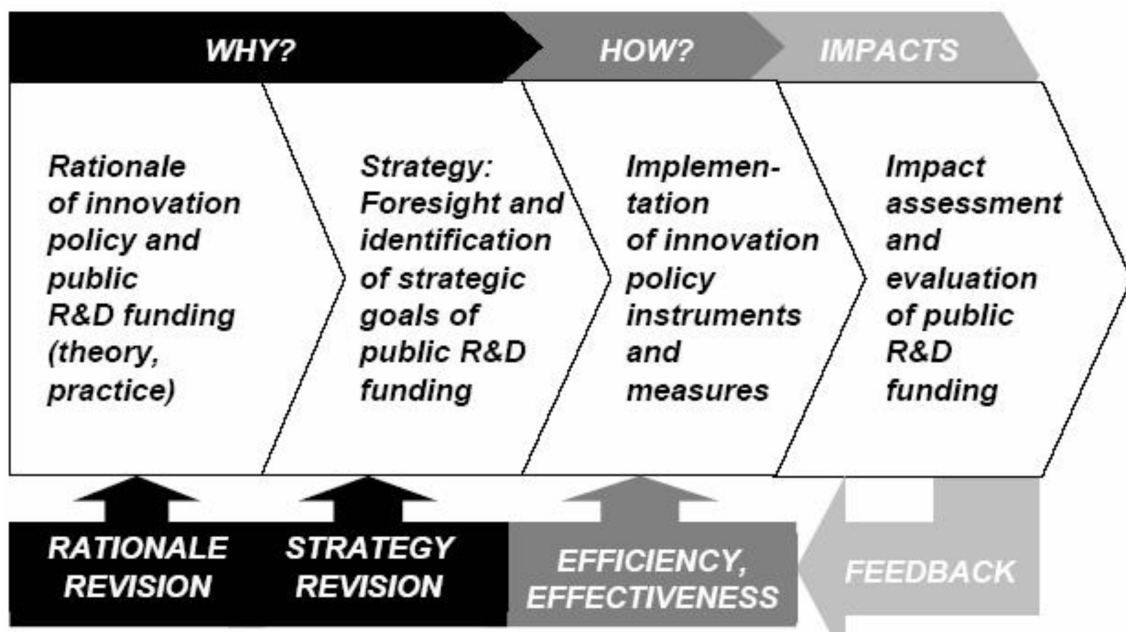
- Path dependence of past instruments as usually policy-makers are very reluctant to drastically modify existent instruments;
- Legitimacy, as some instruments are more legitimate in some territories than others (Peters, 2005);
- Other factors: administrative or budget restrictions, ethics, etc.

Given all these issues that already limit individual instrument choice it is not unusual that limitations for policy-mixes choices are also present.

Policy making in the innovation arena

Instruments are very linked to all the phases of the policy-making cycle, which are design; implementation and evaluation (see Figure 2). Although different phases can be distinguished, in practice this cycle has to be continuous and alive and therefore it is better to identify momentums (like the launch of a plan or an evaluation exercise) than separated phases (Aranguren et al., 2017).

Figure 2: Stages of the policy cycle



Source: Loikkanen et al. (2006)

In the design momentum (or agenda-setting as it is set in the literature of public policies) the main issue to deal with is instrument choice and composition of policy mixes. Then, in the implementation stage, instruments should be monitored to assess the efficiency of the implementation and finally in the evaluation phase, the effectiveness of policy instruments should be an issue to tackle.

One of the main mistakes in practice is that a systemic or holistic view is taken into consideration in the agenda-setting phase and then when the implementation takes place this integrative view is missed. This is what is called implementation gaps (Aranguren et al., 2017).

In the agenda-setting we can identify two approaches from the literature. The first approach takes a policy theory perspective and focuses on how the policymaker(s) identify the problems they want to solve and the ideas to do so. It is therefore an inductive approach and involves a re-interpretation of concepts by policy-makers (Aranguren et al., 2017).

The second approach to agenda setting is a theory-driven one. In this approach policies respond to concrete theories and theoretical problems or rationales. These theoretical problems are the justification for policies to be defined and implemented.

Whereas theoretically it might seem an easy task, understanding the nature of a policy problem is not simple and responses might come from different policy domains and therefore the assignation of problems and responses to a single government ministry or agency might be not be effective if the nature of the problem is shared by different ministries (Aranguren et al., 2017) In consequence, some of the failures in the implementation of policy instruments come from government organizational issues.

Contextualizing policy governance in Lithuania

The economic characterization of Lithuanian governance and institutions involved in the Lithuanian innovation policy, RIS3 development are already described in the baseline study (see Orkestra, 2017). However, in order to understand better the design of the policy mix of AM we consider relevant to provide some insights of the Lithuanian institutional and political context, which undeniably shapes how policies are designed and further implemented (Kroll, 2015). Indeed, the academic literature on RIS3 has shown that the regional traditions and styles of policymaking have an impact on how innovation policy is governed and how RIS3 strategy is developed (Boschma, 2014, Morgan, 2016). The idea is quite reasonable: in regions where there has been a history of more decentralized modes of policymaking and previous government-stakeholder partnerships and cooperation, RIS3 development seems to be more natural than in regions places where those previous relationships didn't exist and had more traditional planning culture.

Lithuania joined the European Union in 2004, and as the other Baltic States it experienced a transformation from a communist economy to a market economy (Karo, 2011). However, although it apparently quickly converged with the rest of EU, the crisis of 2008 made emerge some of the challenges that all Baltic States face, namely: low labour productivity, excessive dependence on foreign investment and external technology transfer for economic growth, low business absorptive capacity and weak innovation system interactions and synergies (Karo, 2011).

Regarding its tradition of policymaking, Karo et al. (2017) characterize Lithuania as a “simple polity type”. This type refers to states that have strong executive power, and where formal types of coordination and stakeholder participations is not substantive and used for deliberating on policy decisions, but mainly to legitimize decisions already made by the executive. Thus, as like other CEE states, Lithuania would be a type of country that “tend to have more legalistic, hierarchical, centralized, and bureaucracy-led styles of policymaking, and weaker established and formalistic types of government-academic-business interaction and public-private coordination” (Karo et al, 2017, p.274). Moreover, these are also characterized by:

- limited local and regional role in economic policies;
- inactivity of politicians in innovation policy and priority setting;
- no active business sector and low degrees of academic R&D demand;
- well organized academic sector;
- dual innovation systems: “government-financed and research-oriented academic R&D systems” in contrast with a less active business sector.

Regarding the IP governance system, Lithuanian innovation system is highly dependent on European Structural and Investment Funds (ESIF) (Karo, 2011; Reimeris 2016) and thus this funding also conditions policy design systems and priority setting. Although innovation policy may be traced back longer, it strongly started in Lithuania in the 2000's. Influenced by EU governance models, as in the rest of Baltic

states, innovation policy was created through joining ministries and Lithuania has adopted a “two-ministry model”, where the innovation promotion is divided between the ministries of Economy and Education. However, the Ministry of Finance has a strong influence, since it exercises a supervising role from an EU finance rules perspective.

However, the capacities of those ministries in designing and managing innovation policies are an issue that needs to be worked on. In fact, according to Reimeris (2016) “policy design and management capacities are weak, especially in the policy designing institutions (the ministries)”. This may explain some of the challenges that are emerging when developing the AM policy mix for Manumix, described later.

In addition, the increasing complex innovation policy governance systems have created also a need for coordination mechanisms, which is one of Lithuania’s innovation challenges as we will describe later. Moreover, Lithuania has made an effort developing industrial policies in parallel to innovation policies and has adopted a sectoral approach through specific technological prioritisation, which according to Karo (2011) increases the difficulties of governing innovation promotion. Nevertheless, as already described in the baseline study, the RIS3 development and the coordination bodies that have been created for its development have brought a significant change in providing an aligned vision and a unique national strategy. This leads to improvements in coordination and may contribute to tackle the institutional fragmentation and the lack of a shared vision around innovation policy (Reimeris, 2016).

Innovation Policy Mix for advanced manufacturing

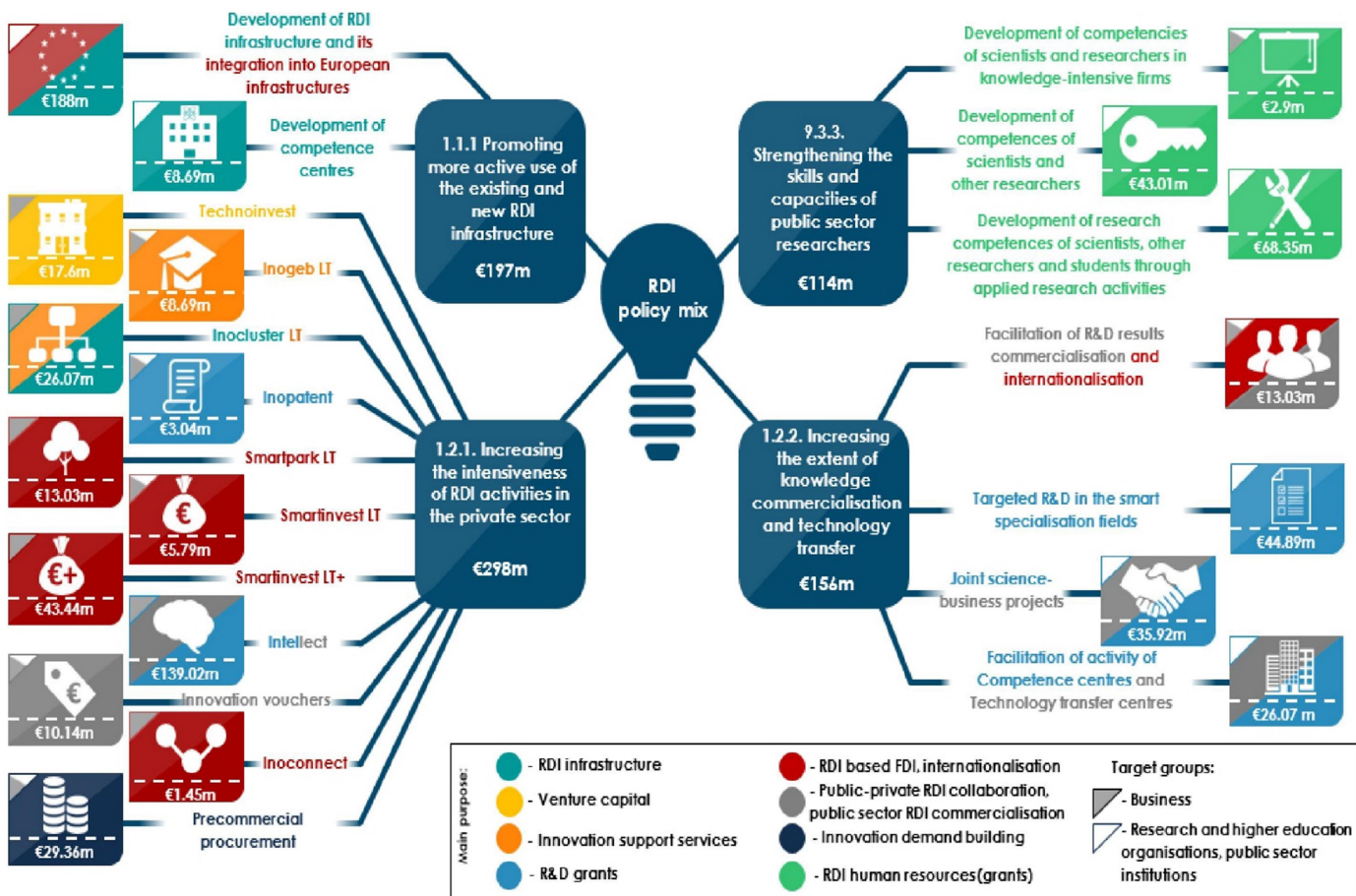
Lithuania does not have a specific policy mix for Advanced Manufacturing. All the innovation policies and instruments of the government are horizontal. However, most instruments incorporate the contribution to RIS3 priorities among the evaluation criteria (non-restrictive). In fact, this is the most usual way to materialize the RIS3 in the regions (Gianelle, et al. 2016). Moreover, some instruments do have specific budget assigned for each of the priorities, and thus, part of the budget is specifically devoted to AM priorities.

Most instruments are still in an early stage and some of them have not been launched yet. The process of launching the instruments has still challenges to overcome since it is taking longer than usual mainly due to administrative burdens. For instance, the first instruments launched by responsible ministries took more than six months to be implemented after the RIS3 strategy was approved in mid-2015 (Reimeris, R. 2016).

Some general features can be highlighted about the Lithuanian general innovation policy mix for Advance Manufacturing:

- (1) The policy mix has a strong dependence on European Funds, since they are mostly fully funded by them.
- (2) There is a mix of instruments that are targeted to demand side and to offer side, with an equilibrated mix of instruments focused on business and research institutions. Several instruments have the goal of fostering science-business collaboration, which is one of the main challenges of innovation in general, and Advance Manufacturing in particular.
- (3) The instruments cover a high range of Technology Readiness Level (TRL), ranging from basic research to commercialization of R&D results.
- (4) The mix is predominated by direct economic instruments (grants). However, there are also financial instruments and projects promoted by the State.

Figure 3: Lithuania's R&D&I Policy Mix (2016-2022)¹



Source: Visionary Analytics, 2017, based on publicly available information from esinvesticijos.lt. Additionally, increase for Targeted R&D in the smart specialisation fields is expected due to cancelled instrument for independent R&D projects.

Innovation policy-mix for Advanced Manufacturing specific for the Manumix project

The policy mix selected for the Manumix project is composed of the following instruments:

Figure 4: Lithuania's Policy-mix for Manumix

- (1) **No. 01.2.2-CPVA-K-703 Promotion of Activities of Centres of Excellence and Centres for Innovation and Technology Transfer, which is divided in two types of calls:**
 - (I) promotion for innovation and tech. transfer action
 - (II) promotion of activities of centres of competence
- (2) **01.2.2-MITA-K-702 Commercialization of R&D**

¹ Based on the latest data, the policy instruments for researchers in knowledge-intensive firms (2,9 mln. Eur) and joint science-business projects (35,92 Eur) were repealed.

(3) No. 01.2.2-LMT-K-718 Targeted scientific research in the field of smart specialization, which is divided in three types of calls:

- (I) Research work executed by high-level groups of scientists
- (II) Attraction of foreign-based scientists for research projects in Lithuania
- (III) R&D activities of parallel laboratories.

Source: own elaboration.

The instruments are fully funded by EU funds and they are included in Operational Programme for the European Union Funds' Investments in 2014-2020, Priority 1 "Strengthening Research and Development and Innovation". This priority aims at "promoting, in a comprehensive manner, effective transfer of knowledge important for the development of new products and the commercialization of RDI results in business-science and other (including international) partnerships; (...) and encouraging higher education institutions to be more active in commercializing RDI results". The instruments included in the selected policy mix for Manumix share the following characteristics:

- They are horizontal instruments, not specific for AM. However, they are targeted to the development of RIS3 priority areas, and they do have some funding assigned to AM priority area, which is established in the selection criteria of projects funded by these programmes.
- The instruments are mainly focused on research entities and universities.
- All three are direct instruments, that is, grants.
- The instruments try to cover high TRL, from 3 to 9.

Figure 5: Main characteristics of Manumix Policy Mix in Lithuania

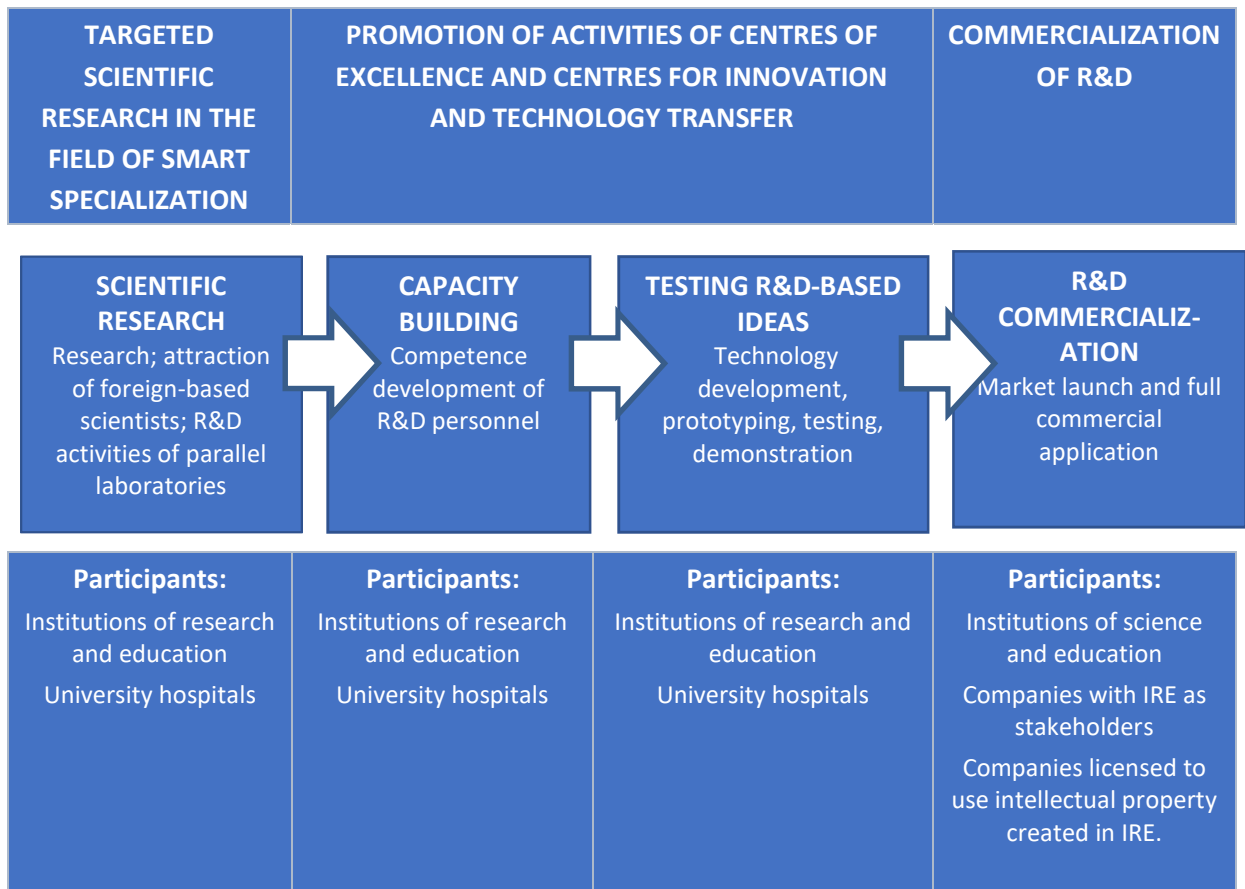
Policy Instrument / Call for Proposals	Objective	Potential applicants	Eligible activities	Budget	Launch year
Promotion of Activities of Centres of Excellence and Centres for Innovation and Technology Transfer (I)	Encouraging research and education institutions to carry out R&D activities with commercial potential	1) research and higher education institutions	Eligible costs: 1) the cost of acquiring equipment necessary for the execution of R&D activities, 2) costs for the acquisition and / or registration of industrial property rights for the execution of R&D activities, 3) the cost of salaries and travel expenses for R&D personnel engaged in the project. 4) expenses for the lease of fixed assets, purchase and / or rental of short-term assets. 5) R&D, consultancy costs related to the testing of ideas with commercial potential, for further R&D investments.	14,5 M €	2017
Promotion of Activities of Centres of Excellence and Centres for Innovation and Technology Transfer (II)	Encouraging the competence centers to test R&D-based, commercially-promising ideas to create a follow-up investment or other outcome that can be tailored to market deployment	1) research and higher education institutions, 2) university hospitals	Eligible costs: 1) the cost of acquiring equipment necessary for the execution of R&D activities, 2) costs for the acquisition and / or registration of industrial property rights for the execution of R&D activities,	11,6 M €	2017

			<p>3) the cost of salaries and travel expenses for R&D personnel engaged in the project.</p> <p>4) expenses for the lease of fixed assets, purchase and / or rental of short-term assets.</p> <p>5) R&D, consultancy costs related to the testing of ideas with commercial potential, for further R&D investments</p>		
Commercialization of R&D	Helps researchers and students to develop innovative products based on the results of R&D.	1) research and higher education institutions, 2) private entities with research and higher education institutions as stakeholders 3) private entities licensed to use intellectual property created in research and higher education institutions.	Commercialization of R&D results from the 7th to 9th R&D stages (support for the commercialization of ideas of scientists and other researchers / students, emerging young innovative companies).	2 M €	2017
Targeted scientific research in the field of smart specialization (I)	Increase the level of knowledge transfer and technology transfer	1) research and higher education institutions, 2) university hospitals	Research carried out by high-level groups of researchers aimed at developing the results relevant to the economic sectors relevant to the activities of R&D, which could then be commercialized	28,9 M €	2017
Targeted scientific research in the field of smart specialization (II)	Increase the level of knowledge transfer and technology transfer	1) research and higher education institutions, 2) university hospitals	Attracting scientists from abroad to carry out research aimed at developing the results relevant to the economic sectors relevant to the activities of R&D, which could then be commercialized.	14,5 M €	2018
Targeted scientific research in the field of smart specialization (III)	Increase the level of knowledge transfer and technology transfer	1) research and higher education institutions, 2) university hospitals	Parallel labs R&D activities designed to produce results that are relevant to the economic sectors in terms of R&D activities, which could then be commercialized.	1,44 M €	2018

Source: Baseline Study: Lithuania (Orkestra, 2016). Updated March 2018.

The instruments of the policy mix have different and complementary objectives. Two of the instruments aim at fostering technology transfer by different means: the first one, by enabling capacity building and research development of institutions of science and education, the second one by encouraging the competence centers to test R&D-based, commercially-promising ideas to create a follow-up investment. The third instrument addresses to late stages of TRL and finances activities to foster commercialization of results.

Figure 6: Lithuania Manumix Policy Mix

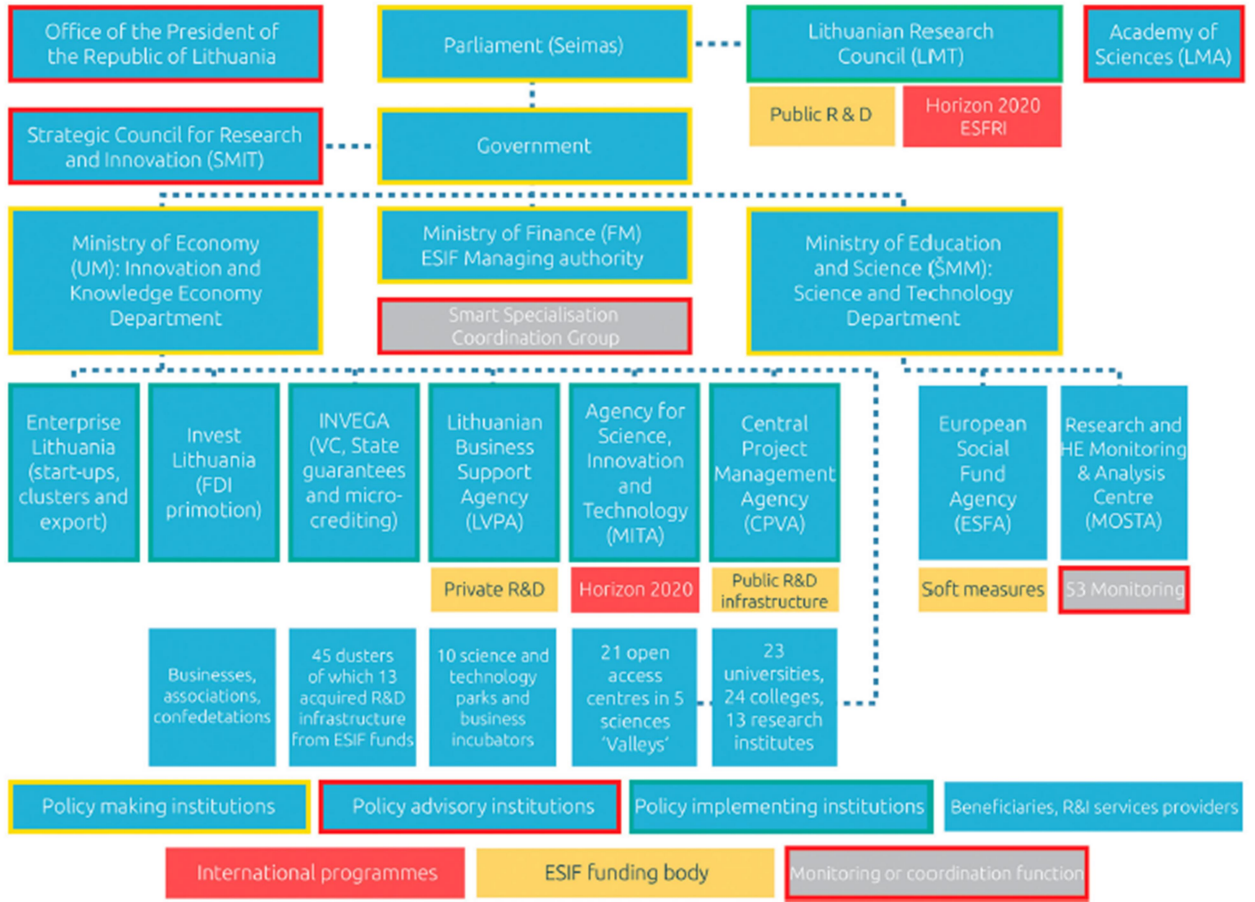


Source: Lithuania Lithuanian Policy-mix Analysis. 2nd Learning Journey.

The policy mix has been designed intentionally to foster interactions between the instruments, specifically a facilitation type of relationship. Facilitation refers to the relationship of two instruments in which the results of one instruments enable the other instrument to function better (Taeihagh, et al., 2013).

The first instrument of the policy mix of the Manumix project (both calls) is administered by Central Project Management Agency (CPMA), an intermediate body established by the Ministry of Finance. Two ministries are involved in the design process. The Ministry of Education and Science conducts the design of the instruments with participation of stakeholders and a joint committee that approves the selection criteria for the instruments. The Ministry of Finance approves and provides the funding for the instruments. Monitoring and coordination function is carried out by several different bodies (figure 7). The second policy instrument is administered by Agency for Science, Innovation and Technology (MITA). The third instrument is implemented by the Research Council of Lithuania (LMT).

Figure 7: Governance structure of the innovation policy-mix for Advanced Manufacturing



Source: Reimeris, R (2016).

The main characteristics of each of the instruments are showed in the following pages.

Figure 8: Main characteristics of the Promotion of Activities of Centres of Excellence and Centres for Innovation and Technology Transfer (1)(I)

NO. 01.2.2-CPVA-K-703 PROMOTION OF ACTIVITIES OF CENTRES OF EXCELLENCE AND CENTRES FOR INNOVATION AND TECHNOLOGY TRANSFER			
Purpose	Supports the knowledge and technology transfer system's functioning within the research and education institutions (process administration).	Instrument	Grants
		Intended for	*Research and higher education institutions
Sector	Horizontal (orientation to RIS3 priorities as optional).	Year of launch	2017
		Budget	14,5M€
Description			
<p>Eligible costs:</p> <ul style="list-style-type: none"> • acquiring equipment necessary for the execution of R&D activities, • acquisition and / or registration of industrial property rights for the execution of R&D activities, • salaries and travel expenses for R&D personnel engaged in the project, • expenses for the lease of fixed assets, 		<ul style="list-style-type: none"> • purchase and / or rental of short-term assets, • R&D, consultancy costs related to the testing of ideas with commercial potential, for further R&D investments. • Maximum amount of funding available for a project is 700,000 Eur, the minimum - 100,000 Eur. • Financing rate – 100 percent. 	

Source: Own elaboration.

Figure 9: Main characteristics of the Promotion of act. of centres of competence and centres for innovation and technology transfer (1) (II) policy instrument

NO. 01.2.2-CPVA-K-703 PROMOTION OF ACTIVITIES OF CENTRES OF EXCELLENCE AND CENTRES FOR INNOVATION AND TECHNOLOGY TRANSFER			
Purpose	Support for researchers and students in identification and promotion of their ideas with commercial potential.	Instrument	Grants
		Intended for	*Research and higher education institutions *University hospitals
Sector	Horizontal (orientation to RIS3 priorities as optional).	Year of launch	2017
		Budget	11,6M€
Description			
<p>Eligible costs:</p> <ul style="list-style-type: none"> • acquiring equipment necessary for the execution of R&D activities, • acquisition and / or registration of industrial property rights for the execution of R&D activities, • salaries and travel expenses for R&D personnel engaged in the project, • expenses for the lease of fixed assets, 		<p>purchase and / or rental of short-term assets,</p> <ul style="list-style-type: none"> • R&D, consultancy costs related to the testing of ideas with commercial potential, for further R&D investments. • Maximum amount of funding available for a project is 1 mln. Eur, the minimum - 100,000 Eur. • Financing rate – 100 percent. 	

Source: Own elaboration.

Figure 10: Main characteristics of the Commercialization of R&D (2) policy instrument

NO. 01.2.2-MITA-K-702 COMMERCIALIZATION OF R&D			
Purpose	Commercialization of R&D results.	Instrument	Grants
		Intended for	*Institutions of science and education, *Private entities with science and education stakeholders, *Private entities licensed to use intellectual property created in research and higher education institutions.
Sector	Horizontal (orientation to RIS3 priorities as optional).	Year of launch	2012 Re-launched in 2017
		Budget	2 M€
Description			
<ul style="list-style-type: none"> Eligible costs: <ul style="list-style-type: none"> salaries for R&D personnel engaged in the project; the costs of goods and services required for the execution of R&D (from the 7th to 9th R&D stages); The maximum funding for the project amounts to 21,000 Eur. 			

Source: Own elaboration.

Figure 11: Main characteristics of the Targeted scientific research in the field of smart specialization (3) policy instrument

NO. 01.2.2-LMT-K-718 TARGETED SCIENTIFIC RESEARCH IN THE FIELD OF SMART SPECIALIZATION			
Purpose	Targeted scientific research in the field of smart specialization.	Instrument	Grants
		Intended for	*Research and higher education institutions, *University hospitals
Sector	Research in the priority fields of the Lithuanian RIS3	Year of launch	2012 Re-launched in 2017-2018
		Budget	44,8M€
Description			
<p>Eligible costs:</p> <ul style="list-style-type: none"> research carried out by high-level groups of researchers (overall sum of the call 28,9 mln. Eur), attraction of foreign-based scientists for research projects in Lithuania (overall sum of the call 14,5 mln. Eur), parallel labs R&D activities (overall sum of the call 1,44 mln. Eur) <ul style="list-style-type: none"> The maximum funding for the research call projects is 700,000 Eur. The maximum funding for the attraction of foreign-based scientists call projects is 1 mln. Eur. Financing rate – 100 percent. 			

Source: Own elaboration.

Table 2. The Results of Lithuanian policy-mix for MANUMIX during March 2018.

Code	Policy Instrument	Overall budget, EUR	Current number of applications	Current number of signed contracts	Current amount of money allocated, EUR
No. 01.2.2-CPVA-K-703-01 (I)	Promotion of activities of centres of excellence and centres for innovation and technology transfer	14 481 001,00	22	9	5 701 274,21
No. 01.2.2-CPVA-K-703-02 (II)	Promotion of activities of centres of excellence and centres for innovation and technology transfer	11 584 801,00	37	0	0
No. 01.2.2-MITA-K-702	Commercialization of R&D	2 027 340,00	7	0	0
No. 01.2.2-LMT-K-718 (I)	Targeted scientific research in the field of smart specialization	28 962 002,00	87	47	28 486 644,29

No. 01.2.2-LMT-K-718 (II)	Targeted scientific research in the field of smart specialization	14 481 001,00	0	0	0
No. 01.2.2-LMT-K-718 (III)	Targeted scientific research in the field of smart specialization	1 448 000,00	0	0	0

Source: MOSTA.

Challenges of the AM policy mix

According to Country RIO Report 2016 (Paliokaitė et al, 2017), the innovation policy challenges remain the same of previous years in Lithuania, although steps have been taken to tackle them. The four main challenges for innovation policy are:

- Coordination within the innovation system and within the public innovation governance. As described in the baseline study, Lithuanian innovation system is a fragmented system with many actors. However, the RIS3 development is being a step forward in this sense, and Paliokaitė et al. (2017) acknowledge the existence of political will to improve the coordination.
- Addressing human resources shortages in R&I. There is overall a lack of workforce supply in Lithuania, especially in higher education, and a mismatch regarding R&I and technology fields that are needed in companies. Besides, the conditions for researchers are not optimal in Lithuania.
- Encouraging private investment in RDI. As already described in the baseline, the private investment in innovation is very low.
- Exploiting opportunities for commercialisation of public R&D results. Although there have been strong investments in public research institutions and research production, there is a lack of capacity for commercialising these results.

The general innovation policy portfolio of Lithuania (described in the baseline study) seems to address these main challenges, with instruments that are focused on different degrees in all the challenges. Within the specific Manumix Advance Manufacturing policy mix, there are instruments that address two of the challenges. Specifically:

- The instrument 01.2.2-LMT-K-718, focused on attraction of scientists and activities of laboratories, and thus, contributes to responding to the challenge of human resources shortages.
- The instruments focused on technology transfer and commercialisation related to the fourth challenge.

Thus, the instruments (besides responding to AM strategy as described in the baseline study) seem to address Lithuania's challenges and thus, fit its needs. Nevertheless, according the assessment made by MOSTA in the framework of Manumix (2nd Learning Journey and for the open call for peer review), it seems to be several problems in the design of these instruments and their management that are hindering strongly their impact and the possibilities of contributing to Lithuania's innovation challenges.

Specifically, there have been problems when implementing these instruments, both relating to an inadequate design of the instruments that do not seem to take into account the characteristics of the beneficiaries; and relating to their management. Concretely, the following problems and challenges have been identified by MOSTA:

Table 3: Main challenges of Manumix AM policy instruments

Policy Formulation Challenges
All policy-mix instruments are financed by the European Union structural funds , due to this reason a lot of additional stringent requirements are added for policy instruments that are unfavorable to the applicants, such as strict applications' evaluation criteria, lengthy and complex application and evaluation processes, <i>de minimis</i> criterion, state aid restrictions and etc.
Also, policy-mix commercialization part is formed for companies and institutions of Lithuania , which makes it impossible to attract foreign companies specializing in R&D as partners.
Public hearings on policy instruments is more formal process.
Position of the Ministry of Finance strongly influences policy formulation process.
Policy-mix instruments do not attract the interest of the applicants, not only due to the constraints of the European Union structural funds, but also due to the lack of a general assessment of the Lithuanian context , i.e. it has not sufficiently considered the real demand for cooperation between business, research and education institutions. Due to the lack of a collaborative culture, it is difficult for applicants to form efficient and effective project teams and properly share project risks. Neither business nor institutions of research and education are determined to pose a high risk, and tolerance to risk is a prerequisite for any successful R&D activity.
In theory R&D policy-mix should be reflected through tiered funding, where one R&D link goes into another R&D in different programs or instruments of the program. Unfortunately, this is practically not fulfilled in this policy-mix, since the evaluation criteria for applications do not reflect the applicants' performance in the R&D activity chain , i.e., participation in other directly related instruments does not act as a leverage in the following application.
In policy instrument No. 01.2.2-CPVA-K-703 requirement for applicants - the number of spin-offs. This requirement strongly limits the number of potential applicants and does not allow the creation of centers of excellence for research institutes that, due to their legal status restrictions, have no opportunity to set up spin-offs.
In policy-mix instrument No. 01.2.2-MITA-K-702 applicants may be only: (1) institutions of research and education, (2) private companies whose shareholders are institutions of research and education, (3) private entities licensed to use intellectual property created in research and higher education institutions ² . Strong limitation of the applicants reduced the attractiveness of the policy instrument and created legal problems to the institutions of research and education, that had to become shareholders of the companies and carry out commercial activities, also research institutes could not be shareholders in the enterprises due to their legal status. Because of strong restrictions on applicants, the first call for proposals was not popular - only 7 applications have been received.
In policy-mix instrument No. 01.2.2-CPVA-K-703 formulated evaluation criteria are strict even to the largest institution of research and education in Lithuania - Vilnius University. The problem arose due to the cessation of budget funding for research and late funding from the European Union structural funds

² This third type of applicants has been included after the first call of proposals for the instrument then only 7 applications have been received.

- researchers have not been able to finance research over the past couple of years, thus losing the opportunity to demonstrate their experience in applying for the instrument No. 01.2.2-CPVA-K-703.

The time frame between the public hearings on the formulation of the policy instruments and the call for proposals is particularly long, which changes the conditions for research and business and the opportunities for participation.

Policy Management Challenges

The process of evaluating applications across all policy-mix is complicated and slow, there is a lack of inter-agency cooperation, relevant independent experts.

In commercialization policy-mix instrument, research and study institutions are reluctant to participate facing potential project risks, especially if applicants are required to ensure the amount of spin-off enterprises and their sustainability. **Tolerance and intolerance of potential risks** are a structural problem both for policy makers and for applicants during the initiation and implementation of innovation commercialization activities.

Similarly, Lithuanian companies want to cooperate with research and education institutions only at a project level. There is **no long-term cooperation and continuity culture**.

The level of production of research and education institutions is greatly overestimated in Lithuanian case. It is generally ignored that commercialization is extremely complex process that includes a lot of different aspects, as licensing, discovery of potentialities, testing, validation, production development, manufacturing and deployment. Ignoring of the later steps of commercialization and emphasizing research part causes problems to the results and effectivity of whole commercialization chain. It means, that the middle part of commercialization chain is financed only partially, emphasizing the management costs, and the final steps of commercialization are left only to companies.

R&D activities in Lithuania generally **lack direct foreign investment**.

Source: presentation of MOSTA in Manumix 2nd Learning Journey, Torino, 21-22 November 2017.

Summarising, we can identify three types of general problems (the specific problems identified within each dimension correspond to problems identified by MOSTA in the Peer review application and in Table 2:

- a) The instruments do not consider the specific characteristics of the beneficiaries of the programmes and thus there have been low levels of applications;
- b) There are problems in the policy formulation process and the management of the programme (timing, evaluation, etc.);
- c) Lack of inclusion of contextual needs and specificities which are relevant for context-based innovation promotion in the policy mix.

Thus, in general sense, we can identify problems related to:

- Capacities of the administration to take into account the needs of beneficiaries in designing programmes;
- Capacities of the administration in assessing the contextual needs and designing a policy mix that responds to such needs;
- Capacities of the administration in management and administration of the programmes.

Equally, MOSTA suggests possible directions for policy learning in the peer review process:

Table 4: Possible orientations for the peer review process

At the policy-mix formulation stage, the integrity and continuity of the individual instruments should be ensured, which could provide the appropriate preconditions for implementing programs more effectively and efficiently. It is necessary to take over good practices in advanced regions, how **ensure the integrity of the instruments when implementing R&D activities**, i.e., how to create a coherent chain of innovation from targeted research to commercialization activities.

It is important to deepen the knowledge of how to design an **appropriate regulatory environment** for the successful implementation of the policy-mixes. It is also important to get examples of good practices on **formulating evaluation criteria of applications** for policy instruments' condition descriptions of the calls.

It is important to receive **good practices on a project applications evaluation process**: how much the process should take, what kind of evaluators should be included, how to develop the databases of the evaluators, how project appraisal agencies should expand their competencies in innovative projects.

It is important to take **good practice in formulating the requirements of TRL policy** for R&D activities and deepen the knowledge how much one instrument or one project can cover TRL levels.

The project's stakeholders would benefit from the expertise of advanced regions in interpretation **how to separate research activities from the development of research activities, also how to separate clearly research activities from commercialization processes**. This division is not clear in the case of Lithuania. It is also important to review the practice of advanced regions in formulating policy tools for science and education institutions that include the **economic aspect of activities** (including *de minimis* practice) - what are the applicable requirements and constraints.

It is also important to deepen the knowledge of **intellectual property regulation**, and to find out the good practices among the regions.

There is a strong need to expand knowledge about **successful commercialization policy instruments** in general, deepening the knowledge not only of regulatory aspect, but also of the funded activities.

It is important to adopt not only successful practices of commercialization policy instruments, but also to deepen the knowledge of the content and context of these practices, to evaluate the possibilities to transfer these practices to Lithuanian case. The most complex challenges of the policy-mix tools are due to the fact that during the policy formulation phase there is not enough taken into account the general tendencies of Lithuanian economy and the real capacity of Lithuanian business to invest in R&D initiatives.

Public authorities would benefit from a **deeper understanding of the concept of state aid** and its application.

Source: MOSTA (2017).

References

- Aranguren, M-J, Magro, E., Wilson, J. R. 2017. Regional competitiveness policy in an era of smart specialisation strategies. In: Huggins, R., Thompson, P. (Eds.), *Handbook of Regions and Competitiveness*. Edward Elgar, Cheltenham.
- Bemelmans-Videc, M.-L., Rist, R. C., and Vedung, E. (eds) (2003) *Carrots, Sticks & Sermons: Policy Instruments & their Evaluation*. London: Transaction.
- Borrás, S. (2009) *The Widening and Deepening of Innovation Policy: What Conditions Provide for Effective Governance?* CIRCLE Electronic Working Paper Series, no.2009/02, University of Lund.
- European Commission (2013) *Lessons from a Decade of Innovation Policy: What can be Learnt from the INNO Policy TrendChart and the Innovation Union Scoreboard*.
- Foray, D., Goddard, J., Goenaga, X., Landabaso, M., McCann, P., Morgan, K., Nauwelaers, C., and Ortega-Argilés, R. (2012) *Guide to Research and Innovation Strategies for Smart Specialisations (RIS 3)*, European Commission
- Gianelle, C., D. Kyriakou, C. Cohen and M. Przeor (eds) (2016), *Implementing Smart Specialisation: A Handbook*, Brussels: European Commission.
- Howlett, M. and M. Ramesh (2003). *Studying Public Policy: Policy Cycles and Policy Subsystems*. Toronto, Oxford University Press.
- Karo, E. (2011). The Evolution of Innovation Policy Governance Systems and Policy Capacities in the Baltic States, *Journal of Baltic Studies*, 42:4, 511-536
- Karo, E., Kattel, R., & Cepilovs, A (2017). Can Smart Specialization and Entrepreneurial Discovery be Organized by the Government? Lessons from Central and Eastern Europe. In Slavo Radosevic et al (eds) (pp.270-292). *Advances in the Theory and Practice of Smart Specialization*. London: Academic Press.
- Loikkanen, T., P. Kutinlahti, and Eerola, A. (2006). Towards an Integrated Framework of Impact Assessment and Foresight Studies in Innovation Policy Analysis. The Second International Seminar on Future Oriented Technology Analysis (FTA). Seville.
- Magro, E., Nauwelaers, C. 2015. Reconciling territorial strategies goals and means: Towards smart competitiveness policies. In: Valdaliso, J. M, Wilson, J. R. (Eds.), *Strategies for Shaping Territorial Competitiveness*. Routledge, Abingdon, UK and New York, USA.
- Morgan, K. (2016). Nurturing Novelty: Regional Innovation Policy in the Age of Smart Specialisation. *Environment and Planning C: Government and Policy* 35(4), 569–83
- MOSTA (2017). *Presentation and internal document for the 2nd Learning Journey of Manumix project*, November 2017.
- Nauwelaers, C., (coord.) (2009). *Policy Mixes for R&D Europe*. E. C. –Directorate-General, UNU-Merit.
- Nauwealers, C. (2015) *The contribution of Peer Reviews to Smart Specialisation Strategies*. Smart Spec Working papers.

- Nauwelaers, C., and Wintjes, R. (2002) Innovating SMEs and regions: the need for policy intelligence and interactive policies, *Technology Analysis & Strategic Management*, 14(2), pp. 201–15.
- OECD (2011) *Regions and Innovation Policy*. Paris: OECD
- Orkestra (2017). *Baseline study: Lithuania*. Manumix project report, July 2017.
- Paliokaitė, A. & González Verdesoto, E. (2017). *RIO country report 2016: Lithuania*. EUR 28492 EN, doi:10.2760/50717.
- Paliokaite, A., Martinaitis, Z. & Sarpong, D. (2016). Implementing smart specialization roadmaps in Lithuania: lost in translation? *Technology Forecasting & Social Change*, 110, 143–152.
- Peters, B. G. (2005) The future of instruments research. In Eliadis, P., Hill, M., and Howlett, M.(eds), *Designing Government: From Instruments to Governance*. Montreal: McGill–Queens University Press.
- Reimeris, R. (2016). New rules, same game: the case of Lithuanian Smart specialization, *European Planning Studies*, DOI: 10.1080/09654313.2016.1179722
- Taeihagh, A., Givoni, M., Bañares-Alcantara, R. (2013) Which Policy First? A Network-Centric Approach for The Analysis and Ranking of Policy Measures. *Environment and Planning B: Planning and Design 2013*, Volume 40, Pages 595 – 616