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INNOVATION FOR SUSTAINABLE DEVELOPMENT REVIEW OF BELARUS

Executive summary and policy recommendations

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EXECUTIVE SUMMARY

The *Innovation for Sustainable Development Review of Belarus* presents an independent evaluation of the National Innovation System (NIS) of Belarus. Since 2011, the Government of Belarus has made significant efforts to upgrade this system in line with recommendations contained in the first UNECE Innovation Performance Review, which was undertaken in 2010. The Review recommends a broader understanding of innovation, to include non-technological aspects. Innovation includes not only new products and services, but also innovative processes. Emphasis is laid on not only cutting-edge technological innovation but also on the introduction of technologies that may exist elsewhere but are new to the domestic market. Furthermore, this Review has a specific focus on the role of innovation policies to foster sustainable development. It analyses the institutional framework of innovation policy and the various mechanisms and instruments of related public support infrastructure. Policy options and recommendations are offered to improve and enhance the innovation capacities of stakeholders and thus help achieve sustainable development goals.

Innovation Policies for Sustainable Development

In 2015, significant international developments took place that will shape innovation policies in the future. The first one was the adoption of the United Nations Agenda 2030 for Sustainable Development, an ambitious action plan with the objective to align economic prosperity with environmental sustainability and social inclusion. Amongst its 17 Sustainable Development Goals (SDGs) and 169 related targets, Goal 9 calls for member States to work together to "build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation". Moreover, innovation is recognized as one of the means of implementation for the entire 2030 Agenda.

Furthermore, the Addis Ababa Action Agenda (AAAA) was adopted at the Third International Conference on Financing for Development, which took place in Addis Ababa in July 2015. The AAAA provides a new global financing framework to mobilize and deliver the resources, technology and partnerships needed for sustainable development. One full chapter of the AAAA is devoted in particular to topics related to science, technology, innovation and capacity building.

One outcome of the adoption of the 2030 Agenda was the launching of a Technology Facilitation Mechanism, with the objective to bolster policies for sustainable development. It is based on a multi-stakeholder collaboration between Member States, international organizations, the private sector and other stakeholders. Its goal is to promote coordination, coherence and cooperation within the UN System on STI-related matters in order to enhance synergies and efficiency (UNECE is a member of this Interagency Task Team).

Belarus has supported these initiatives and will align Government structures and policy towards their fulfilment. With the goal of integrating existing strategies into a longer term policy framework, Belarus prepared a Concept for a National Strategy for Sustainable Socio-

Economic Development till 2030 (NSSSED-2030) and related five-year National Socio-Economic Programmes for their implementation.

The NSSSED-2030 tackles sustainable development challenges around three components: social, with a focus on health, population ageing and migrations, education and social inequalities; economic, with a focus on competitiveness, technological development, access to international markets, know-how, financial resources and energy security; and ecological, with a focus on challenges to climate change, the trans-border transfer of dangerous and harmful substances, the risk of new diseases and exhaustion of natural resources.

One key objective of the innovation policies described in the NSSSED-2030 is to facilitate the transition of Belarus towards a knowledge-based economy. Measures envisaged include the following: the modernization of the scientific sphere; the creation of new research schools and the implementation of strategic programmes of R&D; improving international connectivity; and ensuring the replacement of adequately educated scientific and technical personnel.

With regards to financing of innovation, the NSSSED acknowledges the need to attract investment from private sources (including venture capital funds and PPPs for the establishment of research infrastructure). It is also contemplated to promote cluster structures oriented to high technology final products; and to ensure the transformation of the intellectual property rights (IPR) framework to encourage the commercialization of R&D results.

Policy frameworks, programming and initiatives

Promoting a more creative economy features prominently in the long-term policy agenda. The State Programme for Innovative Development (SPID) 2016-2020 is envisaged as the programmatic means of operationalizing public innovation strategy and policy. It contains a range of ambitious objectives and targets for modernizing the Belarusian economy and raising its international competitiveness. The programme contains seven chapters devoted to different aspects of planning and managing the innovation process and it lists innovative projects that allegedly will help create a competitive advantage for Belarus internationally.

The list includes a small number of projects for the implementation of cutting-edge technologies in areas where Belarus is a technological leader; and a large group of modernization projects, in areas where the country is an innovation-follower. All the projects target the development and commercialization of technological innovation in areas of proven expertise that are defined as priority S&T areas in high-level policy documents.

The further development of innovation-support infrastructure is a also a pillar of SPID 2016-2020. The programme envisages concrete plans for public investment in the development and modernization of nine technoparks in Belarus. In a similar vein, the programme puts a special focus on the objective to raise the export activity of Belarusian firms and increase its high value-added components, although measures are not specifically defined to pursue such an objective.

In addition to SPID, science and R&D activities are governed via two types of funding programmes: 1) State programmes for scientific research (in the past also referred to as “fundamental research”) and 2) State science and technology programmes (formerly referred

to as “applied research”). Both types of programmes provide non-repayable funding to R&D projects for the period 2016-2020. The design of the actual programmes is preceded by a complex and staged foresight process with the participation of institutions such as the National Academy of Sciences, other R&D centres and the Government.

Important legislative and regulatory developments have affected innovation activity and performance in recent years. Notably, two Presidential edicts of 2013 introduced regulations aimed at stimulating innovation activity and the commercialization of research results. For the first time, the access to public grant funding instruments (innovation vouchers and grants), was approved. The other reform concerns the process of commercializing the results of research undertaken with the support of public funding. In addition, a policy aimed at stimulating cluster development was initiated. With regard to changes in the tax regime, over the past five-year period a system of tax incentives for scientific-technological development was adopted, providing tax benefits for high-tech products and manufacturing.

Concerning *innovation finance*, Belarus relies on a banking sector dominated by State-owned institutions, with most decisions on financing innovation in Belarus taken by public authorities - with the private sector remaining underdeveloped. However, since the time of the last Innovation Performance Review in 2010, actions have been taken to bolster the Belarusian R&D and innovation-financing system. Firstly, a Development Bank was established with the goal to become the single channel to finance projects under all Government programmes, including possible innovative investment projects. With regard to SME financing, credit facilities are provided to 11 partner banks to fund SMEs and a new product to support start-ups was launched at the end of 2015 in the form of a loan or credit, typically for up to five to seven years. Regarding the Belarusian Innovation Fund (BIF), recent developments relate to a set of new presidential decrees aimed at improving finance for the latest stages of the innovation process (i.e. commercialization, market entry) as well as new instruments to support the initial innovation phase (i.e. grants and vouchers), which are granted on a non-repayable basis. One major reform was the decision to centralize sector funds into a new Republican centralized innovation fund (2017). The fund will be implemented and managed by the State Committee on Science and Technology. It will have four operating areas: financing innovation projects from the SPID; financing R&D aimed at production of new products, services and technologies; funding the development of innovation infrastructure; and funding the development of sector laboratories.

As regards *NIS public institutions and innovation governance*, Belarus has a relatively well-developed system supporting innovation activity concerning public institutions. Public bodies in the NIS have well-defined functional responsibilities and roles in innovation governance. In addition, the information brokerage functions performed by these institutions (such as support to R&D and technology-oriented forums, exhibitions, fairs, etc.), facilitate linkages and match-making. However, unlike the practice of many countries, where various horizontal councils are in place tasked with policy coordination, governanace in Belarus is by and large performed hierarchically in the form of a top-down decision-making process, which is then communicated along vertical reporting lines to the parties involved. More often than not, such decision-making is preceded by a lengthy and cumbersome preparatory bureaucratic processing by the institutions involved.

On the topic of *international cooperation*, to facilitate further engagement with foreign entities, SCST and the Belarusian Institute of System Analysis and Information Support of

S&T Sphere (BelISA) recently launched a National S&T Portal, which provides comprehensive information on the existing international cooperation agreements to which Belarus is party. Another significant recent development was the establishment of the Eurasian Economic Union. In addition, Belarus participates in the CIS intergovernmental programme of cooperation in the area of innovation until the year 2020. Belarus also has a range of bilateral S&T cooperation agreements with a number of countries and organizations.

With regards to *industry-science linkages, FDI and internationalization,* quantitative indicators show Belarus went through a phase of stagnation in recent years, partly due to external shocks, but also due to weaknesses of the Belarusian business sector and R&D activities. A lack of export-orientation is a hindrance, as it could act as a complement to importing, adapting and adopting foreign technologies. It is likely that innovations will be more successful when Belarus integrates itself into global supply chains, and when it invests further in the highest end of world technologies and becomes more independent from imports needed to produce at a world level of quality/excellence. In Belarus, the spill-over effects linked to cluster activities are hampered by the dominance of large companies within the R&D and innovation process and the fragmentation of the country`s industries (cf. chapter 4). In addition, FDI flows have not been significant. Industry-wise, the largest inflows are geared to categories of low-tech activities like food, wood, coke and refined petroleum products. At present, the main investors in Belarus are Russia, Great Britain, The Netherlands, Cyprus, Austria, Germany and China. With regard to the export of high-tech products, statistics show that Belarus has improved in recent years. However, its performance in absolute and relative values is lagging behind.

Concerning *universities, research centres and intellectual property rights*, the Government considers them as essential drivers for innovation and knowledge generation. A milestone in recent legislation is that universities are allowed to establish small companies to transfer technologies to the market. Belarusian universities and research centres have recently diversified ways of promoting innovations by setting-up new organizational units, be it internally (e.g. National Academy of Sciences with institutions and enterprises subordinated to the NAS), or through improving linkages to external organizations to establish new support infrastructures like technoparks, incubators or start-up centres. Within the context of a gradual change of NAS from being a purely scientific organization to a more applied institution, 72 innovation centres/clusters have been set-up. Many of the NAS research institutes have initiated the formation of their own “clusters” with the participation of businesses. NAS was also involved in the establishment of the new innovation and technology park - BelBiograd.

On aspects of *the intermediary system of support institutions*, Belarus over the last five to ten years has established a complementary infrastructure to promote innovation and technology transfer. From 2012 to 2015 the number of jobs and the production volume of innovation products in organizations that are residents of industrial parks has nearly doubled. The basic directions of activity of residents of technoparks are instrumentation, mechanical engineering, electronics, information technology, software development, medicine, pharmaceuticals, medical equipment, optics, laser technology, energy, energy saving and bio-and nano-technology. One key success story concerns the development of the hi-tech industry. The High Tech Park in Minsk was established with the main goal to foster the ICT industry. It receives strong governmental support and its activities are considered crucial for export growth. Its first residents were registered in 2006. Currently, there are 164 companies

registered as HTP residents. More than a half of them are foreign companies and joint ventures.

Overall, the approach with regards to intermediary institutions is promising and can be a role model for other industries or technological fields. Remarkably, however, all techno- and science parks are organized in a way that no distinction between young companies (often unable to pay the rents), and successful international companies is made. The same applies to support services offered by the centres for all of their residents. International experience indicates that a differentiation between profit-orientation and public services is commonly made to discriminate among the needs of residents and with the goal that subsidies be lifted over time when financial capabilities improve.

Measuring innovation performance

When compared to 1981, Belarus' GDP increased by 2.4 times in 2015. However, the growth of Belarus has significantly slowed since 2010, and it is not clear that it will be able to replicate past performance, as the trend may be strongly impacted by the overall slowdown in the EU and Russian Federation. Furthermore, the growth determinants of the Belarusian economy in the future remain uncertain. Whereas growth in Belarus during the late 1990s and early 2000s was driven by so-called total factor productivity enabled by organizational changes and efficiencies, future sources of growth should be sought in new factors related to technology, innovation and investments. In the long run, a new type of TFP gains will need to be grounded in improved knowledge generation and diffusion.

Regarding the *benchmarking* of Belarus' NIS, an improved international ranking is an explicit policy aim of the Government. The NSSSED-2030 has targeted improved positions in several indexes and ratings until 2030. A motivation behind the policy target is a genuine wish to improve performance by taking easily understood benchmarks. Benchmarking is useful for policy purposes as it provides an international perspective on the position of the country. If used in a smart way, it can provide a critical and unbiased view of a country's strengths and weaknesses. However, comparisons at face value or without understanding of the underlying conceptual approach and country differences in terms of levels of income and institutional practices may lead to misleading or irrelevant policy conclusions.

The overall conclusion of the comparative analysis of Belarus' performance in international rankings, as well as indicators that are relevant for technology upgrading, is three-fold. First, the potential for the technology upgrading of Belarus is very firmly rooted in the CIS growth model and thus shares several structural features with countries in this region (e.g. Russian Federation, Ukraine and Kazakhstan). Second, when compared to more advanced peers, Belarus does relatively well regarding basic innovation inputs (human capital) and infrastructural capabilities (physical capital), but lags behind in the intensity of technology upgrading, R&D and technology capability, and firm-level capabilities. Third, similar to its CIS peers, Belarus lags behind regarding intensity of interaction and knowledge exchange with the global economy. The country also remains loosely connected to value chains and has a low share of FDI.

Still, some positive developments have occurred in recent years that could help revert this deficit. The country has undertaken successful innovations in the development of space industry, nanotechnology, optics and information technology. It is encouraging that its share

of ICT is growing and may become a major driver of macro growth if this sector continues to expand. Indeed, some companies of the High Tech Park have managed to become world leaders in their fields. Scientists of Belarus participated in the EU 7th Framework Programme and continue their engagement in Horizon 2020 (cf. chapter 4)

Another aspect of the National System of Innovation of Belarus is that it is very much oriented towards production capability or supporting problem-solving in the business enterprise sector. There is extensive support for new technology-based firms (NTBFs), but their impact has not yet been reflected in any comparative indicators except in the export of ICT services. Still, NTBFs are crucial as knowledge brokers and specialized suppliers. Their growth is also dependent on the growth of large firms, especially given that 'gazelle' types of NTBFs are still in the early stages of internationalization, with only a few high-profile exceptions (cf. chapter 4 for an analysis of a dual path of technology upgrading in Belarus).

The production orientation of public R&D is visible in the high share of applied R&D at universities as well as through a very low proportion of blue-sky basic research and close links between companies and universities (e.g. through commercialization activities of universities), (cf. chapter 2).

Furthermore, the business sector does not have developed in-house R&D and in that respect, the extramural R&D (academies and universities) plays the role of a knowledge-intensive service industry while branch R&D is *de facto* insufficiently developed. The production-oriented R&D system is further reinforced by the low-risk approach to public funding of R&D with guaranteed return on budgetary funds.

Since the time of the first Innovation Performance Review, there has been further strengthening of the NTBF path of technology upgrading of Belarus, which deserves praise. This is visible through the strengthening of two major technology parks and through successful operation of NTBFs and their good export performance. However, a pending challenge is to enhance the other path (large enterprises) and to promote complementarities between the two paths (cf. chapter 4).

The first innovation policy review of Belarus recommended the Government to update its methodology for the collection of innovation statistics with the goal to follow internationally-agreed standards in similar areas of statistical practice. Such reform would improve the benchmarking of national innovation performance levels across a broad range of EU and non-EU countries based on a common methodology. During the period 2011-2016, the National Statistics Office (Belstat) made significant progress to better align national systems with international practice in line with the recommendations of the report. Important reforms were undertaken, including the adoption of indicators consistent with the EU Innovation Scoreboard and regular innovation surveys at the firm level.

In particular, guidance by the Organisation for Economic Cooperation and Development (OECD), Eurostat, as well as the UNESCO Institute for Statistics was used as a source. Accordingly, new definitions for the gathering of statistics were adopted including the following: definitions of what is innovation (with examples of product, process, organizational and marketing innovation); explanations of the components and range of innovation; and harmonization of existing questionnaires with international practice.

With regards to international comparisons, work was undertaken to produce indicators that allow for the comparative evaluation of Belarus with the other countries covered by the EU Innovation Union Scoreboard (IUS). Statistics are developed annually and published for 16 of the total 25 indicators.

Finally, methodological harmonization was undertaken to update forms used for statistical reporting by institutions carrying out research and development. Other reforms were also adopted in innovation-related statistics and on the nomenclature of economic activities and products. For example, since 1 January 2016, national classifications were harmonized with the latest relevant international versions: by activity (NACE 2008), and by product (CPA 2008).

However, in spite of all the positive efforts to upgrade methodologies and mechanisms for statistics collection, it should also be noted that some important constraints remain in place. For instance, the enterprise survey of innovation activities carried out by Belstat focuses only on the firms' R&D expenditure and innovation output (i.e., sales of innovative products), but it does not cover some of the most critical aspects of modern firms' innovation activity as is the case according to international best practice. Another challenge concerns the population of the national innovation survey in Belarus which is still to cover a representative sample of firms from all sectors.

Innovation in the enterprise sector

In Belarus, many large firms are facing the problem of inadequate modernization of equipment. According to government assessments, the majority of organizations that belong to the large public sector use mid-20th century technologies. One of the main reasons for this reluctance to innovate is the generally low level of market competition.

The economic management of large enterprises is hierarchical and it is characterized by linkages predominantly vertical between ministries and economic entities and enterprises. Reorganization has not significantly changed the traditional high degree of market concentration. In this context, small- and medium-sized businesses are developing only slowly, which limits the pressure on incumbent companies and enables them to survive even without innovating (many large firms have a monopoly position in the Belarusian market).

On the other hand, some firms undertaking research-intensive activities have presented a different path to innovation. Most of these were spin-offs created by university faculties or scientific institutes. Some of these firms are working in university/academy-linked technology parks; and often have undertaken commercialization activities in these venues. Among all these firms, some small firms are valuable as knowledge-producers. They are often spin-offs, knowledge-based, high-tech, innovative firms. They are important actors in the commercialization of knowledge and exploit the inherited knowledge-producing capabilities of the Soviet era, combined with new ideas by more recent university graduates (cf. section 4.4 in this chapter for a discussion of Belarus' *dual path*).

Overall, the cases studies included in this report help inform on the existing challenges to innovation in the enterprise sector and point to priority areas for policy reform. The selected firms were established either privately or by several State-owned entities on special conditions. At the time of their establishment, they obtained the most important equipment

and instruments from research institutes. Furthermore, their workforces were well educated, well trained and had substantial experience with scientific collaboration; and their managers were usually innately talented managers with good scientific records.

However, some of these conditions have significantly changed during recent years; and new challenges have emerged that call for policy reforms in order to sustain their innovative edge. These include the consequences of macro-economic recession, the impact of the progressive reduction in R&D spending and finance, and problems accessing qualified personnel. This information is confirmed by the analysis of survey data.

Two statistical surveys are used to provide information on innovation activities in the Belarusian industrial sector. These are respectively the innovation survey of Belstat (the National Statistical Office of Belarus) and the EBRD-World Bank Business Environment and Enterprise (EBRD BEEPS V) section on innovation.

Statistics show that the percentage of firms that undertook expenditures on technological innovations was higher in the private sector both in 2010 and in 2015. While public firms had a higher share of sales of innovative products to total sales in 2010, this drastically decreased by 2015. In addition, foreign-owned companies represent a small but increasing share, which goes largely into low- and medium-tech industry.

Innovation performance can also vary by economic sectors and activities. If a firm introduces more than one type of innovation, it can also create synergetic effects. According to Belstat statistics, 92.7 per cent of manufacturing organisations made expenditures on technological innovation, 11.7 per cent on organizational innovation and 16.5 per cent on marketing innovation in 2015. The various types of innovation can support each other and improve the firm’s chances of market success.

Concerning innovation in specific economic sectors of firms, high-tech and other emerging activities are usually more innovative than traditional sectors. For Belarus, ICT activities are the "innovation driver" and activities in nuclear sciences are also good performers in novel innovation. Notably, among selected manufacturing industries, the number of innovative firms seems stable over time and across sectors, with some slight increases in certain activities (i.e., manufacturing of electrical and optical equipment, chemical production and manufacture of pharmaceutical products).

A recent analysis by BelISA helps explain the survey findings. It concludes that Belarusian companies do not have sufficient own funds to finance RDI (Research, Development and Innovation), or are hesitant to invest in risky projects. At the same time, the State could not provide them with sufficient financial support, which is also due to the crisis and a tight budgetary policy. This situation produced a decline in innovation development and, therefore, the number of innovation-active enterprises decreased.

It should be highlighted that there are several obstacles which are more important for small companies than for medium and large ones. Access to land, access to electricity, political instability as well as customs and trade regulations appear to be a priority for smaller firms. In addition, some other factors hamper more the non-innovative medium companies, such as tax rates, the practice of competitors and access to finance.

The role of eco-innovations fostering sustainable development

In Belarus, government policies for the promotion of eco-innovation are embedded in the country's broader sustainable development agenda. A look at the national statistics of Belarus shows that some success has occurred with regards to environmental policy during recent years, for instance on reducing the incidence of ozone-depleting substances. On the other hand, waste management, which has significant implications for disease control, remains a priority area in the field of environmental protection. A specific issue that has attracted Government attention is the management of radioactive pollution from the Chernobyl accident in 1986.

With regards to policy instruments that promote green economies, Belarus applies a range of measures aimed at increasing incentives for sustainable practices in industry and other sectors. These include environmental taxes on air pollution and waste, compensation for damages, and specific charges for pollutants. Taxation is integrated with a system of annual emission limits. Several reforms have taken place since 2011, including the approval of legislation obliging producers and importers of harmful products to assume the responsibility for collecting, neutralizing and/or recycling them. Priorities on the need for mainstreaming green economy principles in education have been formulated in the National Action Plan for the Implementation of the UN Economic Commission for Europe (UNECE) Strategy on Education for Sustainable Development in the Republic of Belarus for 2010–2014 and other programmes.

Overall, both *supply*- and *demand-side* measures contributed to a number of achievements to improve environmental performance, such as a decrease in air pollution from mobile sources, progress in integrating environmental education and education for sustainable development in formal, non-formal and informal education.

The Ministry of Natural Resources and Economic Protection (MNREP) has been implementing significant innovation projects that were included in the State Programme of Innovation Development for the period 2011-2015. Seven projects involved innovation activities on environmentally significant areas. Among these, five were in the field of geology and two in the field of hydrometeorology, although their impact on sustainability is not always clear. So-called *green public procurement* policies have also been initiated, but remain at the very early stage of implementation. In addition, funds allocated to the various R&D activities included innovative technologies for the efficient use of natural resources; sustainable forest management; new technologies for water supply, wastewater treatment and processing of secondary municipal waste; and improvements in energy efficiency.

Regarding international cooperation, MNREP enjoys the support of the European Union and initiatives have been held to bring expert advice on eco-innovation. The goal has been to set up a plan for the development of the green economy and to develop sustainable patterns of consumption and production through the use of incentives. However, whereas MNREP has the research capacity to assist in the development of innovative products, its knowledge of aspects of the commercial viability of green products is limited. Because greening the economy is a multi-faceted sphere, there is a need for coordinated policy action involving delegates from other ministries not linked directly to the environment (e.g. social protection, trade).

The Department of Energy Efficiency of the State Committee for Standardization is the main Government agency implementing policies to promote energy efficiency. In 2009, Belarus became a member of the International Renewable Energy Agency; and since that time has already adopted a Law on Renewable Energy (2010). In 2010, a National Energy Saving Programme for 2011 - 2015 was approved by the 2010 Resolution of the Council of Ministers (No. 1882) with the very ambitious goal to reduce the energy intensity of GDP in 2015 by half, taking into account environmental requirements, social standards and provisions of energy security indicators. Another programme was also adopted with a focus on renewable sources of energy; namely, the National Programme for the Development of Local and Renewable Energy Sources for 2011-2015 (PDLRES).

Although PLDRES has succeeded in significantly reducing the energy intensity of GDP, it has not had a transformative impact yet on the composition of energy sources. The share of renewable sources of energy still amounts to only a marginal amount of total supply of energy resources in Belarus, fluctuating between four and five per cent in recent years. Also, most standards have not been embraced by private firms. Although the legal framework for private firm certification and eco-labelling is broadly based on modern international standards (i.e. ISO 14024 and EU requirements), the practical implementation of product eco-labelling has lagged and no independent body for environmental certification of products is in place. However, voluntary approaches to standard setting are emerging as a result of competitive pressures on enterprises that work on markets with stricter environmental management regulations.

Since 2012, private firms can generate and re-sell electricity using existing electricity grids, provided it is from renewable sources. Legislation also allows foreign investors to build up and operate power installations based on renewable energy sources. Indeed, the renewables sector - together with the pharmaceuticals, automotive and food industries - is one of the four priority areas for FDI attraction highlighted by the National Agency for Investment and Privatization. Overall, domestic private sector involvement in the renewable energy sector remains limited, even if some national enterprises have been active as intermediaries. In particular, SMEs are involved in such areas as consulting and representing big energy brands, as well as the production of local fuels, with a focus on wood and agricultural waste fuels. Although innovation could make a significant contribution to the expansion of renewable energy and thus energy sustainability in Belarus, significant constraints remain due to a lack of demand from households whose energy bills remain significantly subsidized and a resulting lack of profitability and access to funds for investment on the part of utilities.

Going forward, the development of energy efficient technologies and production of alternative fuels will be an unavoidable feature of a successful strategy for sustainable development. Although it is not envisaged that Belarus will have a specific programme on “green” innovations, there are several projects that imply incremental improvements in the use of existing technologies. For instance, in recent times, the MNREP - in cooperation with other interested parties - developed a national action plan on the introduction of green economic principles in the national industries of Belarus up to the period 2020. Also, amongst key R&D programmes, the State research programme on “Energy Systems, Processes and Technologies for 2016–2020,” under the auspices of the National Academy of Sciences and the Ministry of Education, supports a basic research project implemented by the Heat and Mass Transfer Institute of the NAS, the Belarusian National Technical University and other R&D players. The project includes the following priority areas - energy and energy

efficiency, nuclear energy; environmental management and deep processing of natural resources. The SPID 2016-2020 also contains modernization and innovation projects to be undertaken by companies and research organizations with regards to energy efficiency.

However, the actual share of public funding for research activities in eco-innovations remains very limited, with an average of only five per cent in recent years. As is the norm in Belarus, research programmes have been developed in such a way that they are intended to cover the whole innovation cycle from ideas to their embodiment in a particular product or service. But the strict compliance requirements with State-funded projects contribute to the shrinking of completion frameworks and goals, which reduces the attractiveness for long-term private investments.

Policy recommendations

Each of the chapters of this Innovation for Sustainable Development Review contains a list of recommendations, which cover multifaceted areas for policy action with distinct time horizons and sequencing. Because the recommendations are addressed to different Government agencies and institutions, coordination amongst ministries will be crucial for successful implementation. Table 1 presents a summary list of recommendations with related policy actions.

Table 1. Summary of Recommendations

Chapter 1: Innovation Policies for Sustainable Development		
	Recommendations	*Related policy actions*
1.	Improve the policy framework for implementation of SDG agendas	Establish an effective mechanism of inter-ministerial coordination based on an understanding of interdependency of different problems and factors, synergy of goals and efforts to address cross-cutting issues.
2.	Adopt indicators, targets and monitoring mechanisms with regards to fostering eco-innovation.	a) Future revisions of the NSSSED 2030 and other programmes should identify specific objectives, indicators and monitoring mechanisms for benchmarking eco-innovations; b) Relevant ministries should work with the National Statistical Committee to set up indicators on specific variables (e.g., R&D expenditures on renewable sources, use of innovative environmental technologies, etc.)
Chapter 2: Policy frameworks, programming and initiatives		
	Recommendations	*Related policy actions*
1.	Ensure conceptual consistency in the typology of innovation policy targets and align these targets with matching policy instruments.	The SCST and other institutions could consider: a) Further transform SPID into an overarching document incorporating objectives and targets of the State R&D programmes; b) Consider identifying under the State S & T programmes a separate category of high-risk "science, technology and innovation" projects; c) Amend legislation to provide for the risk of innovation in acts regulating the issues of implementation of the various programmes and innovative projects; d) Develop practical guidelines for the assessment and sharing of risk.
2.	Initiate a gradual transition from predominantly vertical to predominantly horizontal policy mechanisms and instruments in the	The SCST and other institutions should: a) Increase the share of funding earmarked for high-risk "S&T innovation projects" and early-stage financing and reduce the share of low-risk investment projects; b) Within public early-stage financing, increase substantially the share of grant financing and reduce the share of loans; c) Align policy instruments and mechanisms and design new ones for

	innovation policy mix.	the implementation of horizontal-type innovation policy.
3.	Ensure a better match between the strategic objectives of innovative development and the available policy instruments and public funding to pursue such objectives.	The SCST and other institutions should: a) Ensure proper matching of available policy instruments and funding in the implementation of SPID 2016-2020; b) Consider introducing open horizontal competitive calls for collaborative innovative projects; instruments supporting international linkages, increased grants for innovative University startups or spinoffs; setting up new instruments and innovation programmes catering to the specificity of non-technological innovation; c) Specify in public-funded programmes in research and innovation which policy instruments will fund what programmatic activities.
4.	Streamline innovation governance with a view to rationalizing public sector decision-making related to innovation policy implementation.	a) SCST should prepare, in consultations with the public bodies concerned, proposals for optimizing the screening and evaluation process of innovation and R&D projects; b) The Government should consider the establishment of a joint Inter-agency Funding Committee to take the final decision on the release of public funds for all R&D and innovation projects. Alternatively, an Innovation Council could be established; c) The Government should consider measures for better aligning the implementation of S&T Programmes with the objectives of SPID.
5.	Initiate measures for the further development and strengthening of the NIS and the enhancement of weak components.	SCST in cooperation with other bodies should: a) Set up a system of monitoring linkages and collaboration in undertaking innovation activity; b) Strengthen international linkages leading to global technology-centred value chains as a strategic objective of innovation policy and set up monitoring instruments; c) Set up non-financial coordination instruments to support connectivity and linkages (e.g. mentorship for start-ups); d) Strengthen the systemic role of intellectual property rights (IPR); e) Design targeted tax incentives to encourage private sector engagement in the early stages of innovation financing; f) Develop additional tax incentives comparable to those existing for residents at the High-Tech Park and the Chinese-Belarusian industrial park “Great Stone”; g) Adopt measures to improve the fragmented business structure, the shortage of R&D centres, the lack of engineering and other innovation service firms, and a weak tradition in open innovation; h) Launch programmes and supporting schemes to nurture competitive supplier firms around leading innovative companies.
6.	Set up a system of measures to strengthen innovation-related competition and spur bottom-up entrepreneurial initiatives.	SCST in cooperation with the Ministry of Economy should; a) Consider possibly aligning competitive calls with the Law on Public Procurement; b) Define incentives for the participation of foreign applicants of a desired type (e.g. linked to global technological value chains); c) Define the significant increase of innovative entrepreneurship (in particular, private/individual innovative entrepreneurs and SMEs) as a strategic objective and set concrete targets, in particular, for the support of technology-based start-ups and spin-offs.
7.	Improve innovation finance mechanisms.	a) Implement the support of early-stage, or the initial R&D phase, with vouchers and grants as well as venture funding; b) Shift from financing low-risk (infrastructure) projects to (early-

		stage) high-risk projects; c) Consider further foreign partnerships within the context of venture financing; in addition, seek ways to actively attract further foreign investors; the "good practice" example of the incubator at the High-Tech Park, should be extended to other industries/areas.
8.	Innovation-related loans, particularly regarding the financing of SMEs and start-ups should be intensified.	Strengthen the capacities of the new Development Bank.
9	Improve both the innovation potential inherent to foreign direct investment inflows and cross-border technology transfer.	a) Evaluate the mechanisms of the National Agency of Investment and Privatization concerning innovation-related and technological issues or science-intensive investments; b) Improve international cooperation in technology-transfer activities; c) Identify and further promote "good practice" examples of Belarusian companies in global value chains or regarding the establishment of strategic partnerships.
Chapter 3: Measuring innovation performance		
1	Fully adopt best international standards in the collection of innovation statistics as reflected in Eurostat's CIS Harmonized Survey questionnaire.	The National Statistical Committee should take into account the expert advice of the UNESCO Institute for Statistics on the proposals of the SCST on the improvement of statistical reporting forms 1-NT (innovation).
2	Improve training of statisticians gathering innovation-related data and indicators.	The National Statistical Committee should consider seeking technical cooperation support, including through training activities with UNECE Statistical Division, Eurostat, OECD and/or UNESCO statistical office as well as with the participation of international experts with knowledge of CIS economies.
3	Increase the population of trainees on innovation-related statistics.	Consider extending the training activities beyond the National Statistical Committee to include surveyed organizations and potential users to understand better the logic of the innovation survey and its indicators.
4	Widen the scope and coverage of the innovation surveys in line with international best practice.	The National Statistical Committee should: a) Consider a broader population of enterprises in future surveys, which should also focus on non-technological innovations; b) Include more small firms in the targeted population of the innovation survey; c) Consider a more intensive use of the available data; d) Consider involving other stakeholders from civil society.
5	Indicators should inform policy, but only rarely should they become a policy target.	At the time of designing national strategies and programmes, Government bodies should not target individual specific indicators with only the narrow aim to improve the overall ranking on a specific international index
Chapter 4: Innovation in the enterprise sector		
1	Improve risk sharing between firms and Government.	a) The SCST and other bodies should be investing in expensive risky innovation from public funds, including through co-financing; b) For establishing and nurturing financial actors (venture capital, business angels), the BIF should consider options providing seed capital and introduction of tax breaks; c) Pre-determined competition should be eliminated to make

		competition conditions equal for State-owned and private firms, including foreign entities operating in Belarus.
2	Consider increasing State financial support to approach better the critical mass of financial resources for RDI.	Government agencies should: a) Ensure that allocation of public funds for innovation meets development objectives; b) Seek changes in the allocation of State support from slowly growing low- and medium-tech sectors to the promising medium-high and high-tech sectors; c) Include more non-reimbursable financial support for risky projects; d) Set up programmes for nurturing innovative start-ups and further developing innovative SMEs; e) Consider tax exemptions and tax credits on intramural R&D activities; f) Discuss strategies for providing assistance for international patents and incentives for patenting abroad; g) Government should reduce significantly bureaucratic effort for public R&D and innovation support.
3	Improve labour and skills development policies.	SCST, in cooperation with the NAS and the Ministry of Education should: a) Provide training for manager-practitioners in the field of R&D, innovation, knowledge management, technology transfer; b) Provide educational, training and consulting services for innovative enterprises and scientific-research organizations involving practitioners and researchers; c) Attract international experts with complementary knowledge, support on-the-job training and coaching; d) Continue the good activities on improving the business environment; e) Support job placements of PhD students, graduates and researchers.
4	Undertake measures to strenghten the Belarusian knowledge triangle.	Undertake measures with the goal to remove barriers affecting legislation, organizational matters, staffing, and access to finance, in line with the recommendations of findings of the Government Working Group under the TEMPUS project on “Fostering the knowledge triangle in Belarus, Ukraine and Republic of Moldova”.
Chapter 5: The role of eco-innovations fostering sustainable development		
1	Enhance R&D capacities on green technologies.	The authorities should target spending in green and eco-innovation projects. In particular, research on energy efficient technologies should be encouraged by competitive allocation of resources.
2	Seek engagement on international initiatives.	Additional financing could be obtained from international climate funds. Cooperation between national and foreign R&D institutes should be further encouraged.
3	Further deepen awareness campaigns.	Build on existing initiatives with UNDP to improve further education on climate change and the sustainable development goals in education institutions and to address the public.
4	Stimulate demand for eco-innovation.	Green public procurement mechanisms have been considered and could be further developed with the goal to disseminate green products and eco-innovation. In the long run, public procurement processes should be simplified in order to enable SMEs to compete for State contracts on a level playing field.
5	Introduce modern energy-efficiency and fuel-efficiency standards as well as building	Move towards the cost-reflective pricing of energy and water services with adequate social protection for the poor in order to enhance incentives for the adoption of progressive adaptation technologies and the sustainable use of natural resources.

	codes and infrastructure resilience parameters in order to improve sustainability.	
6	Improve policies for the generation of knowledge, absorptive capacity of the economy, the diffusion of innovation and demand for innovation.	Better and more efficient policy coordination both in design and implementation in this area, including capacity building. In addition, the authorities should consider introducing specific mechanisms and instruments that encourage and facilitate linkages among stakeholders.
7	Enhance financial instruments supporting eco-innovation.	Firstly, consider introducing grant schemes to support R&D on eco-innovation. Also, establish project-based eco-innovation financing instruments that encourage the development of industry-science cooperation and inter-firm linkages, including by promoting climate-resilient infrastructure through public-private partnerships.