



ARMENIA



Chapter I

ECONOMIC OVERVIEW

General overview

Armenia is a small, landlocked, upper-middle-income country in the South Caucasus, neighbouring Azerbaijan, Georgia, the Islamic Republic of Iran and Turkey. Its transition to a market economy, challenging in its own right, has been compounded by political instability and conflict and closure of borders with Azerbaijan and Turkey. The deceleration of economic growth in 2014 – caused by declines in remittances and in the volume and prices of copper exports, and the Russian commodity crisis (IMF, 2018), as well as overreliance on remittances and rickety public finances – make its economy vulnerable, especially with investment contracting and productivity stuck at low levels. High levels of outmigration spur the expansion the Armenian diaspora, while its potential remains underused. Far-reaching, though far from complete, reforms have ensured sustained but volatile growth in gross domestic product (GDP), following a radical slump after independence and the global financial crisis. These reforms also have ensured renewed dynamism in sectors such as tourism and information and communication technology (ICT) services. Nevertheless, innovation will be essential for finding sustainable growth paths that expand and make the most of a legion of opportunities, in particular for further economic integration with the European Union (EU) and the former Soviet Union.

Reform process

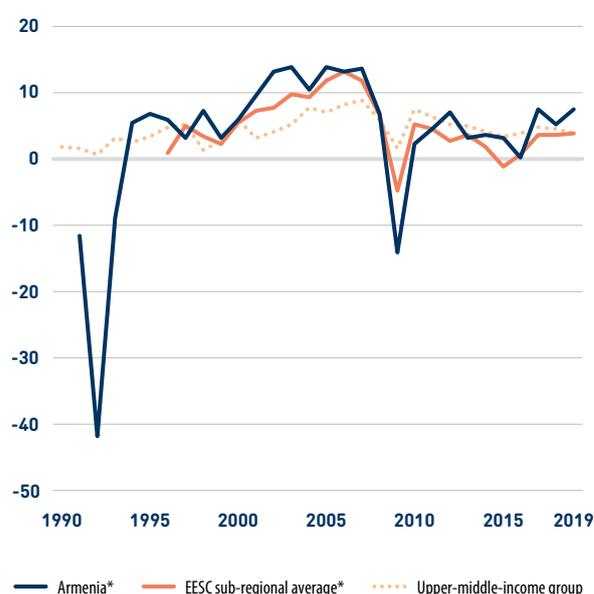
Since Armenia attained independence in 1990, the economy has changed fundamentally – although more recently, the pace of reform has slowed. Several market-oriented reforms took place, including financial liberalization, large- and small-scale privatization, and reform efforts towards increased trade and investment. Improvements in tax and customs administration in 2011–2014 helped rein in corruption, and current reforms focus on attracting foreign direct investment (FDI) and improving the business climate, primarily by reducing regulatory obstacles to private sector development. In 2018, anti-government protests driven by the high levels of corruption in the ruling government led to a peaceful change in power known as the Velvet Revolution, providing new momentum for further institutional reforms. Indeed, Armenia ranked 47th of 190 economies in the 2020 *Doing Business* report, an improvement from 2010, when it ranked 61st. Nonetheless, weaknesses in domestic market competitiveness and corporate governance limit growth prospects for Armenian firms, with ample scope for rent-seeking and incentives that steer investment towards established, low-capital-intensive activities rather than diversification and innovation (World Bank, 2017).

GDP growth

Following an initial sharp decline after independence, Armenia saw significant growth in the 2000s – 11 per cent on average – fuelled by external investment flows and significant job creation in booming sectors, such as construction (figure I.1). After the economic decline caused by the global financial crisis, the main drivers of Armenia’s economic recovery were the mining industry, specifically the expanding production of copper, and the growing IT industry in the services sector. After a slight decline in 2015, GDP per capita in current US dollars increased from \$3,592 in 2016 to \$4,623 in 2019. Robust growth has been sustained at 7.6 per cent, driven by expansions in services, industry and trade, although growth is expected to decline to below 2 per cent in light of the pandemic (World Bank, 2020d). GDP per capita based on purchasing power parity doubled from 2009 (\$7,233) to 2019 (\$14,220) (in current international US dollars), putting Armenia ahead of the Republic of Moldova (\$13,574) and Ukraine (\$13,341) (World Bank, 2020b).

Following the 2008–2009 global financial crisis, the country’s rate of growth became increasingly exhausted. Structural weaknesses in the Armenian economy and the country’s vulnerability to external shocks, in addition to high unemployment rates, inhibited further economic growth (IMF, 2019). The decline in growth rate was compounded by the crises in Russian commodity prices and subsequently in Russian currency in 2014–2015, leading to rapid declines in both remittances and FDI. Personal remittances fell from 19.7 per cent of GDP in 2013 to 11.2 per cent in 2019 in the wake of the crisis and devaluation, while remaining a significant share of income. The country’s high dependence on remittances is largely due to the size of the Armenian diaspora – between 6 and 8 million people in 2017, comprising well-established and organized communities worldwide (box I.1). Gross capital formation has declined more recently, from 22 per cent of GDP in 2018 to 17 per cent in 2019.

Figure I.1 • Annual GDP growth, 1990–2019 (Per cent)



Source: UNECE, based on data from the World Bank (2020b).

*Missing values for the Republic of Moldova (1990–1995), and Armenia, Belarus and Azerbaijan (1990).

Box I.1 The Armenian diaspora

Of 11 million Armenians, only 3 million live in Armenia, making the diaspora one of the largest in the world. This diaspora is essential to the country as a source of not only personal remittances but also FDI, ideas and contacts. Although engaging with the diaspora has triggered some innovation, such as in ICT services, its potential is underexploited, giving ample room for effective public support as part of an overall effort to promote innovation and experimentation for sustainable development.

Source: World Bank (2017).

The Government responded through entitlement spending and infrastructure investment, but this will be unsustainable in the long run, as public debt grew to \$6.2 billion in 2017 (almost a twofold increase since 2010), at 53.7 per cent of GDP (EC, 2019). Domestic consumption drove growth, especially through demand for construction in the 2000s, but stagnated over the past decade. Government expenditure in 2018 amounted to about 23 per cent of the country's GDP, while the account deficit reached 8.2 per cent of GDP in 2019, a decrease from 2018 (9.4 per cent) but not reaching the value of 2016 (2.1 per cent).

Foreign direct investment

FDI flows, predominantly from the Russian Federation, Germany and Greece, have gradually declined as a share of GDP since the global financial crisis, falling to 1.9 per cent in 2019 (from 3.2 per cent in 2016), the lowest in the Eastern Europe and the South Caucasus (EESC) sub-region (World Bank, 2020b). Among the main contributors, after the mining and energy industries (Bogov, Kresic and Beschastna, 2019), are the largest Armenian diaspora communities – those in the Russian Federation, the United States and the Islamic Republic of Iran. Armenia's moderate wage levels, skilled labour force and natural resources should make it an attractive target. So far, however, most investment has been market- and resource-seeking, flowing into transport, telecommunication, ICT, energy, metallurgy, tourism and mining.

Sectoral decomposition

The production structure in Armenia reveals a reliance on low-productivity activities with limited diversification. After the structural destruction that took place in the 1990s – accompanied by rising inequality, high unemployment and poverty – macroeconomic stabilization focused on export-led growth, most visibly in the export of commodities such as metals, tobacco and liquor (Gevorkyan, 2015). The share of agriculture in GDP has declined over the past decades, to 12 per cent in 2019, yet remains the highest among the EESC countries (UNECE, 2014; World Bank, 2020b). Although employment in the sector is decreasing, reaching 30 per cent in 2019 (World Bank, 2020b), weak and outdated infrastructure makes productivity in agriculture the lowest among all sectors (Bogov, Kresic and Beschastna, 2019). The value added of industry remained stable at about 25 per cent between 2014 and 2017, with a slight decrease to 24 per cent in 2019, and industry employed 17.2 per cent of the labour force (World Bank, 2020b). The value added of manufacturing has increased by two percentage points since 2015, to 11.7 per cent in 2019 (World Bank, 2020b). Yet agriculture, mining and manufacturing activities are driven mainly by the production of low value added commodities (Bogov, Kresic and Beschastna, 2019). In contrast, the services sector now makes up more than half of the economy (54 per cent of GDP), especially in trade, tourism, financial services and the growing, export-oriented ICT sector (chapter II) (EIF, 2018). It employed 53.2 per cent of the labour force in 2019.

Demographics

Population growth has fallen from 0.5 per cent in 2013 to –0.25 in 2018 (Armstat, 2020) – the second highest rate among EESC countries after Azerbaijan (0.87 per cent) (World Bank, 2020b). This points to low fertility rates, at the same time as outmigration was increasing (World Bank, 2020b). Formal unemployment rose sharply starting in 2007 – from 9.8 per cent to 18.4 per cent in 2009 – and has stagnated since, at 17 per cent in 2019. This level of sustained unemployment is the highest among EESC countries, indicative of the continued systemic inability of the economy to innovate, restructure, create job opportunities and build the right skills (Honorati et al., 2019). Given the strong indications of skills mismatches in the labour market – a result of both inadequate policy responses to reforming education and significant outmigration – innovation, sustainable growth and employment overall likely will continue to be constrained.

External position

Since joining the World Trade Organization (WTO) in 2003, Armenia has gradually opened up to trade but remains constrained by high transport costs arising from its geographical position and partially closed borders, with most goods trade passing through Georgia. Armenia joined the Eurasian Economic Union (EAEU) in 2015, with access to the Russian, Belarusian, Kazakh and Kyrgyz markets. It concluded a range of bilateral and multilateral trade agreements, including with Georgia and Japan, as well as with the United States and the EU under the Comprehensive and Enhanced Partnership Agreement, since June 2018 (EC, 2020). For a small country, the sum of exports and imports of goods and services is high, at 91.3 per cent of GDP in 2018 (World Bank, 2020c), with exports of goods and services accounting for 38.5 per cent of GDP.

The low level of export diversification and the reliance on low value added manufacturing exports remain impediments to further economic growth. According to the index of merchandise concentration for exports, where values range between zero (diversified) and one (concentrated), exports from Armenia (0.27), are one of the most concentrated in the EESC sub-region (0.27), compared with those from the Republic of Moldova (0.19) and Belarus (0.18). They are more diversified than only Azerbaijan (0.83) (UNCTADstat, 2020b). The main commodities exported in 2018 were copper ore (24.3 per cent), gold (12.1 per cent), ferroalloys (6.9 per cent), rolled tobacco (9.3 per cent) and hard liquor (6.8 per cent), amounting to more than half of exports of goods; the remaining share was distributed across various groups, (HS4) such as textiles, vegetable products and machines (OEC, 2020). These commodities represented among the strongest revealed comparative advantages (RCAs) of Armenia, with products (in the three-digit group) such as tobacco, alcoholic beverages, copper ores and pig iron with RCAs over 10 (UNCTADstat, 2020c).

According to the 2019 Competitive Industrial Performance (CIP) Index, which measures industrial capacity and impact on the global market, Armenia ranked 103/150, lower than Georgia (96), Belarus (47) and Ukraine (69) (UNIDO, 2019). Furthermore, the Global

Competitiveness Index (GCI) ranked Armenia 70/140 in 2018, an improvement from the previous year (72); the country's competitive strengths lie in the labour market (33), the product market (39), skills (55) and ICT adoption (56) (WEF, 2019).

Institutional quality

In 2018, with a score of -0.2 , Armenia's institutional quality – assessed as an average of the 2018 World Governance Indicators (Kaufmann and Kraay, 2020) – was the second highest in the region after Georgia (0.5) and slightly above the regional average (-0.3). As higher governance scores indicate better institutional quality, the negative values suggest that there is still room for improvement, given that corruption (-0.35 in 2018), rule of law (-0.15) and inefficient government bureaucracy (-0.02) remain among the main obstacles to business innovation, after access to finance.

Sustainable development

Growing income disparities risk undermining long-term sustainable development in Armenia. The country's Gini index rose from 28 in 2009 to 34.4 in 2018 (World Bank, 2020b), as remittances fell and fewer jobs were available for low-skilled workers following the decline in the construction sector. Despite substantial progress, in 2018 about 23.5 per cent of the population still lived below the national poverty line (World Bank, 2020). In 2019, the rate of participation in the labour force of women (modelled International Labour Organization (ILO) estimate) was about 47 per cent, substantially lower than that of men (74 per cent). Yet in 2018, approximately 63 per cent (gross) of women were enrolled in tertiary education, which is not only a sizable increase from the 19 per cent recorded in 2000 but also higher than the 47 per cent of men enrolled in 2018.

The country scored second highest in the EESC region (80/129) in terms of GDP per unit of energy use in the 2019 GII. Overall carbon dioxide emissions rose consistently between 2015 and 2018 (Armstat, 2020), and the mining sector remains one of the main sources of both chemical waste and pollution (Armenia, 2018). Although Armenia relies on imports of oil and natural gas for the majority of its energy consumption, it produces a significant amount of energy from domestic nuclear and hydroelectric power plants. The country has adopted policies to promote renewable energy production, increasing the number of small hydropower plants with the aim of fostering sustainability (World Bank, 2017). In addition, good progress has been made in environmental protection in terms of enlarging protected areas and biodiversity.

Synthesis

This table presents the main achievements of and challenges for the economic development of Armenia, based on the findings described in this chapter.

Progress made so far

- Increased international trade from accessing new markets and maintaining liberal trade policy
- Market-oriented reforms that improved the business climate and institutional quality
- Expanded services and manufacturing, rapidly developing the tourism, agribusiness and ICT sectors
- Good progress in environmental protection and energy efficiency

Challenges ahead

- Further diversify exports to take advantage of trade opportunities in products and services.
- Maintain the strong reform momentum and increase market competitiveness, stimulating productivity in agriculture and other sectors (such as through innovation).
- Ensure efficient institutional governance and quality in public administration to remove or mitigate the effects of constraints on experimentation and tackle corruption.
- Diversify domestic and foreign investment, in particular into efficiency-seeking, export-oriented activities, through targeted innovation and FDI policies and greater engagement with the diaspora.
- Achieve a higher level of economic development by raising employment and reducing poverty across the country.
- Address structural inefficiencies to mitigate the skills mismatch between the labour force and the labour market.

Source: UNECE.

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Website

Armenian Energy Agency: <https://energyagency.am/en>

Chapter II

INNOVATION PERFORMANCE OVERVIEW

Innovation climate

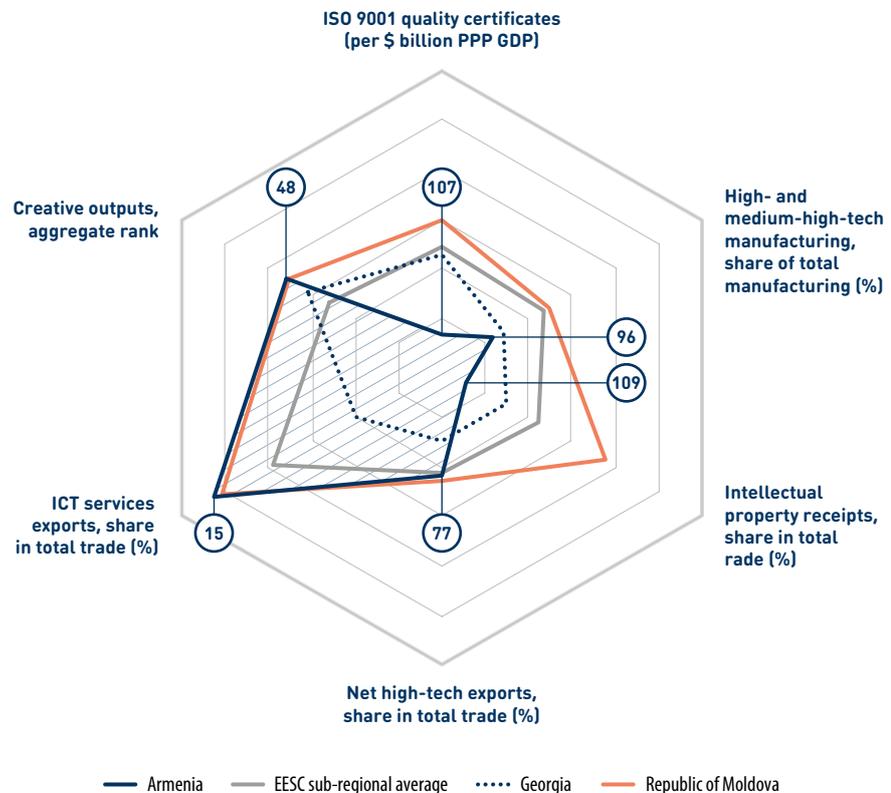
Armenia's strong economic growth in recent years, driven by a significant expansion of the services sector and the improved business climate, has made a positive impact on the country's innovation performance. The ICT sector is growing. The economy efficiently translates innovation inputs into outputs, with several niches of excellence, such as ICT services exports and creative outputs. Further progress towards a more knowledge-based economy is impeded by significant gaps that remain in the national innovation system, including weak investment in research and development (R&D), low levels of competitiveness and business innovation, the low quality of education, the low level of innovation absorption capacity and the skills mismatch in the labour market.

Innovation outcomes

In 2019 Armenia was classified as an innovation achiever in the Global Innovation Index (GII), ranking 64th out of 129 economies, slightly below the sub-regional average (62nd). In terms of innovation outputs, the economy's performance on the global scale varies from leading its peers (in ICT service exports and creative outputs) to lagging behind them (in quality certificates from the International Standards Organization (ISO) and intellectual property receipts). Figure II.1 on the following page depicts the country's innovation performance on selected output indicators, as ranked globally in the 2019 GI.

In terms of innovation outputs, the country performed well on ICT services exports (ranking 15/129) and on creative outputs (48/129), scoring above the sub-regional average. It showed particularly strong performance in trademarks (18/129) and industrial designs by origin (52/129). In contrast, for the share of high- and medium-high-tech goods in total manufacturing output, Armenia ranked the lowest (96) of the EESC countries, well below the sub-regional average (73). The share of high-tech exports in manufactured exports was 1.1 per cent in 2007 but rose to 9.9 per cent in 2019 (World Bank, 2020a). This ranked Armenia 77th in the 2019 GI for high-tech net exports (0.6 per cent of total trade), outperforming Azerbaijan (0.1 per cent) and Georgia (0.3 per cent), but still lower than the Republic of Moldova (0.7 per cent) and Belarus (1.8 per cent). Armenia has not yet been able to generate significant revenues from selling or licensing intellectual property abroad. Perhaps more worryingly, domestic companies overall have not made significant progress in attaining international quality standards, as measured by the number of

Figure II.1 • Innovation performance by selected GII indicators – 2019 ranks



Source: UNECE, based on data from Cornell University, INSEAD and WIPO, 2019.
Note: Lower value signifies stronger performance.

ISO 9001 quality certificates relative to GDP. Meeting international quality standards in production is one of the major steps in upgrading technology and a prerequisite for integrating into international value chains and penetrating foreign markets.

The lack of recent national and sectoral data on private sector innovation activity compounds the gaps in the policy support system. In the latest Business Environment and Enterprise Performance Survey (BEEPS V) of the European Bank for Reconstruction and Development (EBRD, 2017), Armenian firms identified low access to finance as the main obstacle.

The rapid growth of the ICT sector has driven the expansion in service exports. Because of the country's improved business regulatory performance, the ICT sector provides substantial opportunities for further growth (Amirkhanyan, 2017; World Bank, 2020d). ICT services exports have risen to 11 per cent of all exports in 2017, considerably higher than in Azerbaijan (1.4 per cent) and Georgia (2.3 per cent), but still lower than in the Republic of Moldova (14 per cent). ICT goods exports, which constituted 1.26 per cent of total export goods in 2012 but decreased to 0.16 per cent in 2013, have been relatively stable in recent years, amounting to 0.19 per cent in 2017. This was higher than in Azerbaijan (0.02 per cent) but lower than in the Republic of Moldova (0.28 per cent)

and Georgia (0.56 per cent). The ICT infrastructure has also improved in recent years, with fixed broadband subscriptions increasing steadily within the last decade, from 0.47 per 100 people in 2008 to approximately 11.8 per 100 in 2018. Nonetheless, subscription levels are still lower than those in the Republic of Moldova (15 per 100), Azerbaijan (19) and Georgia (21). In the 2019 GII, although Armenia scored above average in terms of ICT access (36th), it ranked 67th globally on ICT and organizational model creation, 70th in ICT use and 88th in ICT and business model creation, highlighting the weak performance in process innovation in the economy.

Innovation activity – channels, strengths and weaknesses

Innovation outcomes are a reflection of the innovation activities that firms undertake. Firms can innovate by absorbing and adapting knowledge and technology from abroad, by generating innovation in-house through R&D and by collaborating with scientific organizations to commercialize academic research. These three channels are not mutually exclusive. On the contrary, they are typically complementary. To be successful in any and all three of these channels, firms need innovation-specific skills both in their management and in their work force. The remainder of this chapter discusses Armenia's strengths and weaknesses along these dimensions.

International knowledge transfer

For small, open, middle-income economies like Armenia, absorbing and adapting existing knowledge from abroad offers significant scope for raising productivity, competitiveness and economic growth at relatively low cost and risk (Goldberg et al., 2008). The three main conduits of foreign knowledge inflows are imports of machinery and equipment, FDI and the licensing of foreign intellectual property. Foreign knowledge absorption in Armenia remains low, ranked 114/129 on the 2019 GII (Cornell University, INSEAD and WIPO, 2019). Armenia ranks below the top 100 economies in ICT services imports, high-technology imports and intellectual property payments. In 2013, ICT goods imports were 3 per cent of all goods imported; in 2017 they rose to 4.13 per cent, higher than in both Azerbaijan (3.7 per cent) and the Republic of Moldova (3.9 per cent) and lower than in Georgia (5.7 per cent) (World Bank, 2020a). High-tech imports constituted 4.8 per cent of total trade, exceeding the share in only Azerbaijan (2.8 per cent) in the rest of the sub-region. Moreover, only 1.7 per cent of gross expenditure on R&D is financed from sources abroad.

FDI inflows accounted for 1.9 per cent of GDP in 2019, the lowest among the EESC countries. Nevertheless, with foreign enterprises having a 35 per cent share of the domestic market, the growing ICT sector gives rise to significant opportunities for knowledge absorption and expansion in service exports, while supporting a national start-up movement in ICT. The 2019 Global Competitiveness Index (GCI) ranked the country above the average for the upper-middle-income group on ICT adoption. Nonetheless, both further investment in R&D and development of skills are required to improve the country's absorptive capacity and adoption of knowledge across sectors.

Investment in R&D

Investment in R&D, an important part of fostering innovation, is low – from both foreign and domestic sources. Foreign funding of R&D in Armenia is quite modest considering the country's rank in the 2019 GII (82/129), higher only than that of Azerbaijan (100) in the EESC sub-region. Public gross expenditure on R&D has declined steadily since 2015 (when it stood at 0.25 per cent), signifying the low priority given to science and technology policy. The officially reported figure was approximately 0.19 per cent of GDP in 2018, similar to the level in Azerbaijan (0.18 per cent) but significantly lower than the sub-regional average of 0.34 per cent (World Bank, 2020a). The official figure is a lower bound, as it includes only public sector spending.

The number of researchers in Armenia has deteriorated over the past several years, with a 12 per cent decline during the period 2010–2017, largely because of demographic trends and underfunding. According to the EU Horizon 2020 background report, natural sciences constituted 54.2 per cent of all research fields in 2018, followed by the humanities (including Armenian studies, which is growing in importance) at 14.3 per cent. At the same time, research in agriculture amounted to barely 2.1 per cent, despite the major role of the sector in the national economy (chapter I).

Industry-science linkages are few, with university-industry collaboration on research ranking 89th globally in 2019. This results from the generally low innovation capacity in the business sector, as well as the underinvestment in public science and research and insufficient alignment between the priorities of academic research and the needs of the economy.

Limited official data exist on R&D investment in the business sector. According to the report of the Pilot Survey of Innovation Activity of Legal Entities and Entrepreneurs (Armstat, 2017), 34.9 per cent of innovative enterprises engaged in in-house R&D in 2017; 33.2 per cent acquired machinery, equipment and software; and 19.6 per cent introduced innovations to the market. According to the EU Horizon 2020 background report, R&D performed in the business sector – most of it at foreign firms and some large domestic firms – concentrates predominantly in ICT and engineering, providing opportunities for knowledge absorption and innovation (EC, 2019). Indeed, as of 2018, the share of tech companies with foreign ownership was 30.4 per cent of the industry total (243) (Catalyst Foundation, 2019). By contrast, little evidence exists of innovation in small and medium enterprises (SMEs) outside the ICT sector. In 2018, about 64.1 per cent of the country's 68,600 SMEs were active in wholesale and retail trade, and in repair of motor vehicles and motorcycles; barely 9.8 per cent operated in manufacturing and approximately 5 per cent in professional, scientific and technical activities (Armstat, 2019).

Armenian researchers have a significant number of international co-publications, in part driven by the country's diaspora networks (chapter I). In 2017 these mainly focused on physics and astronomy (65 per cent of all co-publications), engineering (17 per cent) and medicine (11 per cent). The average number of citations per publication in Armenia is the highest in the EESC sub-region, followed by Georgia (6.31) and the Republic of Moldova (5.94) (EC, 2019).

Skills development

Expenditure on education has increased, but its still-low level results in problems with quality. In the 2019 GII, Armenia ranked 111th on educational investment. The share of GDP accounted for by education increased to 2.8 per cent in 2019 (from 2.3 per cent in 2017) because of the priority the Government has given to reforming the education system. Yet that share is still exceeded in all other EESC countries. In the 2019 Quacquarelli Symonds ranking, Armenia (78th) ranked lower than Ukraine (46th), Belarus (57th) and Azerbaijan (72nd). Nevertheless, in 2018, the tertiary enrolment rate was 54.6 per cent, a marked rise from the 2015 rate of 46.5 per cent (World Bank, 2020a). Growing numbers of students are specializing in economics, with an increase from 14.5 per cent to 31.1 per cent of enrolled students during 2010–2017. Consequently, the share of students in science, technology, engineering and mathematics (STEM) as a share of total enrolment has decreased slightly (from 20.5 per cent in 2010 to 18.7 per cent in 2017), ranking Armenia 88th globally in 2017.

The skills mismatch on the labour market is growing, as rapidly evolving sectors such as ICT fuel demand for highly skilled workers. Some 29.4 per cent of Armenian workers are employed in knowledge-intensive jobs. Vocational education, which attracts approximately 20 per cent of secondary school graduates, is not yet well developed, and the technical base at higher-education institutions (HEIs) is reportedly insufficient in both quality and quantity. This makes it difficult for students to transition successfully to the labour market (EV Consulting, Economy and Values Research Centre, 2010; 2017). Furthermore, only 16.2 per cent of Armenian firms offered formal training in 2019. To improve the quality of education in Armenia and to support the economic growth driven by the expanding ICT sector, investment in education should be increased.

Synthesis

This table presents the main achievements of and challenges to R&D and innovation (RDI) in Armenia, based on the findings described in this chapter.

Progress made so far

- Good overall performance in knowledge and technology outputs on the global scale
- Rise in ICT services exports and ICT access
- Significant increase in high-tech export share in manufactured goods
- Improved entrepreneurship environment, resulting in an emerging start-up movement

Challenges ahead

- Enhance human capital and research capabilities and reduce the skills mismatch on the labour market.
- Stimulate business sophistication and knowledge absorption.
- Improve the collection of data on the RDI activity of businesses.
- Increase levels of R&D investment in both the public and the private sector.

Source: UNECE.

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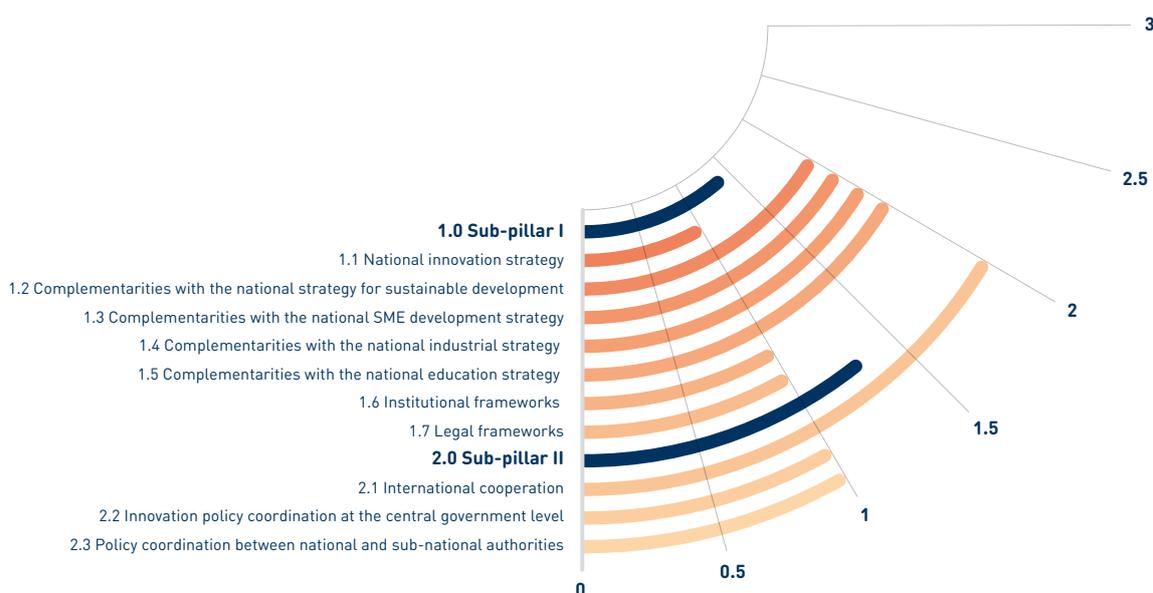
Chapter III

PILLAR I: INNOVATION POLICY GOVERNANCE

The first pillar of the IPO reviews the overarching strategic, institutional and legal framework for innovation policy, as well as the competences of and coordination among government bodies involved in innovation policy. This review assesses the extent to which innovation policy governance is sound, well-structured, efficient and flexible.

National innovation policy governance – strengths and weaknesses

Figure III.1 • Scoring of sub-pillars: innovation policy governance



Source: UNECE.

Note: Each indicator is assessed using a score from 3 to 0. The highest score (3) is given to fully fledged policy initiatives and mechanisms that can provide mutual learning opportunities for the EESC sub-region. A score of 2 is assigned if a policy initiative is operational. An indicator receives 1 point if a policy initiative is under development. The lowest score (0) is given if a country does not have a specific policy mechanism, strategic document or policy initiative. The indicators are based on an extensive questionnaire answered by national government agencies and external consultants. The questionnaire consists of open, binary and multiple-choice questions. Additional statistical data supplement the formal assessment framework by informing on key socioeconomic trends and context conditions. Statistical data are not directly integrated into the qualitative indicators but are used to guide scoring decisions. For more information, please refer to Methodology and Process.

As a small, landlocked country facing external and internal challenges, Armenia focuses on driving intensive economic growth through technology and innovation. During the last few years, the Government has launched reforms aimed at supporting science and innovation. Although the national science and innovation system is still nascent, its key elements are gradually emerging, with the creation of technology centres in Gyumri and Vanadzor and the establishment of the Granatus venture fund. In the Soviet era, Armenia formed a strong foundation in scientific research, and optics and electronics remain competitive advantages of the economy. The burgeoning growth of the IT sector builds on factors that include a large pool of skilled professionals and low capital expenditures in the sector. Other strengths include the recognition of the importance of science and innovation at the highest policymaking levels, successes in developing elements of the national science and innovation ecosystem, a well-networked diaspora that supports the development of research and business activities in Armenia, and the shared valuing of higher education by broad swaths of civil society. The state budget is under constraint, and there is a need for greater efficiency and effectiveness in policy initiatives. Legal and institutional frameworks for innovation policy are still in development. Strong mechanisms for coordinating innovation policy are also still missing, which leads to fragmented and duplicative policy efforts.

Table III.1 Overview of sub-pillars and indicators for innovation policy governance

Sub-pillar I: Innovation Policy Frameworks	Sub-pillar II: Innovation Policy Coordination
National innovation strategy	International cooperation
Complementarities with other policy areas	Innovation policy coordination within the central government and between national and subnational authorities
Institutional frameworks	
Legal frameworks	

Source: UNECE.

Sub-pillar I: innovation policy frameworks

Given the many government levels involved in the design and implementation of innovation policy, it is vital to have a strategic document containing the Government's overarching vision.

National innovation strategy

Armenia does not yet have a functional innovation strategy. The Government is developing a national strategy on science, technology and innovation-based industrial development that is expected to offer a shared vision of national science and innovation goals, identify priority areas, and consolidate the efforts and resources of stakeholders.

The draft proposes concentrating on a limited number of research fields and industrial sectors. Well-coordinated efforts aimed at developing a specific set of priority areas could help Armenian firms integrate more deeply into global value chains and create favourable conditions for economic prosperity.

The national innovation strategy focuses sharply on export orientation. As a small economy, Armenia needs access to foreign knowledge and expertise so as to fuel growth in productivity. The priority given to integrating into international research and innovation networks is reflected in a number of policy documents, including the law on scientific and technological activity and the Concept Paper on the Initial Strategy for Formation of Innovation Economy.

The development of Armenian research has been shaped by the Strategic Programme of Development of the Scientific Sector 2017–2020. The programme strives to improve governance in public organizations that conduct RDI, raise the standards for the quality of scientific research and modernize research facilities and equipment. The programme addresses the separation of education from scientific research and calls for measures aimed at fostering positive synergies between teaching and research. It also outlines measures for promoting academia-industry collaboration and strengthening international research cooperation.

Complementarities with other policy areas

In addition to the national innovation strategy, the Armenian Government is working with the Asian Development Bank to develop the national industrial strategy. It is expected to have two components. The first is oriented to modernizing traditional industrial sectors by importing skills, technologies and knowledge from the countries of the Organization for Economic Cooperation and Development (OECD). Through changes in legislation and investment into skills and supporting infrastructure, the Government plans to attain productivity growth of 2.12 per cent growth in traditional industrial sectors by 2025. Two-thirds of public expenditure under the first component of the national industrial strategy will be channelled to supporting education and R&D.

The second component of the industrial strategy is dedicated to leap-frogging to more advanced stages of industrial development. The Government sees the ongoing “next production” revolution and recent advancements in manufacturing technologies as opportunities for reducing the productivity gap between Armenia and developed countries. By 2030, it envisions the creation of a globally competitive national IT sector and tight integration of Armenian enterprises into global value chains. The strategy includes a clear logical framework (input, output, outcome and impact) for monitoring, assessing and evaluating its implementation. Within the national industrial strategy, the Government plans to launch an international mobility programme, providing the opportunity for 2.5 per cent of STEM students to have an exchange year in leading foreign HEIs.

Domestic research conditions and the technological base do not enable the growth of innovative enterprises (UNECE, 2014). Access to foreign knowledge and technology is constrained by the low levels of integration of Armenian companies into global value chains and by low FDI. Although some domestic enterprises successfully provide innovative solutions for international markets, the economy is not driven by innovation and technological intensity is low. Serious barriers to the growth of innovation include

the low demand for innovation among Armenian enterprises, the lack of a full-fledged national science and innovation system, numerous legislation gaps and problems with enforcement, and the lack of linkages among science and innovation actors.

At the same time, the industrial structure is not favourable for accelerated development of RDI. The manufacturing sector has a limited share in the economy, contributing only 11 per cent of gross value added (EC, 2018). Less technology-intensive sectors – such as agriculture – have larger shares, leading to a lower uptake of manufacturing technology and innovation. Other key challenges include the development of the equity market in the country's volatile and uncertain socioeconomic situation, a lack of mechanisms for good-quality corporate governance, and the lack of skills and capabilities among domestic enterprises for successfully transferring research findings into products and services.

In 2001, the Government recognized the ICT sector as a key priority. Investment into digital government infrastructure contributed to the emergence of an e-health system, an automated vehicle licensing system and an electronic identity card system. A recent project is the Travelinsight AI platform, designed to help the Government formulate tourism policy. The platform uses web-crawling and scraping techniques to build a picture of the positive and negative aspects of travel in Armenia. Government authorities can use insights gathered through the platform to modify tourism policy. The Armenian Electronic Procurement System has streamlined the whole procurement cycle from planning through financial transactions. Digitalizing procurement has contributed to greater accountability and transparency, creating potential gains for successful delivery of public services.

In 2008, the Government adopted a national IT development strategy for the next 10 years. The strategy targeted developing ICT infrastructure, promoting digital start-ups and creating a workforce with the required digital skills. In cooperation with foreign partners, Armenia enabled the establishment of national ICT research centres. Examples include the Armenian National Engineering Laboratories, the Armenian-Indian Centre for Excellence in ICT, the Centre of Innovative Solutions and Technologies of IBM, and the Microsoft Innovation Centre. The availability of skilled professionals and the quality of the business environment have attracted multinational IT companies such as Oracle, D-Link and Synopsis to launch R&D activities in the country. A number of IT start-ups and small and medium enterprises (SMEs) have become successful globally (World Bank, 2020).

Over several years, the Government has launched a number of policy initiatives to support the growth of ICT firms and increase the pace of job creation in the sector. Armenian ICT businesses can benefit from incentives covering taxes on profit and income. To produce positive synergies among ICT stakeholders, the Government organizes events and forums such as the ArmTech Congress and the annual DigiTech Business Forum.

To reduce the mismatch between education and the needs of the job market, the Ministry of Education, Science, Culture and Sport (MoESCS) is preparing a set of reforms designed to bring about positive changes in 10–15 years. They seek to make the education system more responsive to the needs and demands of industrial development. New curricula for secondary education, to foster STEM skills and spark creative and innovative thinking, are expected to be adopted in the near future. There are plans to raise teacher salaries to the level of the average salary in the country. The MoESCS cooperates with other government authorities and international partners on introducing new terms of work and sets of incentives for teachers. Jointly with private sector representatives, the ministry

has introduced new principles of lifelong training for adults and offered online training courses. It seeks to align national education with the Sustainable Development Goals (SDGs). National education guidelines are being developed using the UNICEF framework and the Council of Europe frameworks for democratic culture.

Other reforms aim to strengthen synergies between research and education. Mergers of some public research institutions and HEIs will take place in the near future. The number of HEIs will decrease, to consolidate resources and improve the quality of education and research. An important direction of ongoing reforms is promoting business entrepreneurship. The MoESCS is working on changing behaviours and attitudes in the research community to be more entrepreneurial. The allocation of public research funding will be rationalized and will be based on the national science priorities defined for five years. The ministry is also planning to increase project-based funding to provide organizations that perform RDI with additional resources and incentives to foster research excellence.

Institutional frameworks

Armenia is undergoing some institutional changes that affect responsibility for policymaking. The newly established Ministry of High-Tech Industry is the main government body in charge of formulating and implementing the national innovation policy. The Ministry of Economy will support technological upgrading and innovation in traditional industrial sectors, while the Ministry of High-Tech Industry will promote innovation in high-technology sectors. The decision to split responsibility for innovation policy between two ministries may be logical from an operational viewpoint; however, it will be important to ensure sufficient levels of coordination to prevent fragmentation of policy efforts.

The State Science Committee of the MoESCS has been the main government body responsible for formulating, designing and implementing science policy since 2015. The committee supports the development of scientific research and fosters linkages between academia, industry and education.

The National Academy of Sciences of Armenia, the main body performing research, consults on policy, though its participation is becoming more constrained. In addition to conducting R&D activities at its 33 research institutes, the Academy provides informed advice to the Government on issues related to science, technology and innovation policy. The Academy is directly subordinate to the Government and operates with a large degree of autonomy. New laws introduced by the Ministry of Education seek to diminish the role of the Academy in science policy. Other public research institutes include 12 State HEIs and 23 branch State research organizations.

The SDG Innovation Lab, an innovation hub for the Government, aims to accelerate the implementation of the SDGs and their alignment with Armenian national priorities. It is actively involved in pioneering behavioural studies, data analytics and citizen-centred research approaches. To monitor progress in achieving the SDGs, it operates an SDG barometer. Co-founded by the Government and the United Nations Development Programme (UNDP), the Lab operates under the aegis of the UNDP but with the status of a government body. It is co-chaired by the Prime Minister and has several deputy chairs, including the UNDP representative in Armenia and the Chief of Staff of the Office of the Prime Minister. It collaborates constantly with government agencies and

cooperates with the UN. The SDG Innovation Lab maintains close cooperation linkages with international partners including the United Kingdom's Good Governance Fund, the EU, the World Bank, NESTA, the Asian Development Bank and the Russia-UNDP Trust Fund.

Through focal points in all ministries, the Lab identifies and aggregates data on SDGs that are scattered across government bodies. To increase the low numbers of people getting health check-ups, it launched behavioural studies for the Ministry of Health, with the support of the World Bank. Subsequently, the rate of check-ups increased by 320 per cent. The Lab is also diversifying its portfolio of projects in tourism and education.

Legal frameworks

The Law "On State Support for Innovation Activities", adopted by the National Assembly in 2006, is the main legal document in Armenia defining the scope of innovation policy and the roles of government authorities. Now outdated, it requires revision in order to fully reflect the current policy agenda and recent socioeconomic and technological trends.

Armenia is one of the few post-Soviet states that has designed a regulatory framework for the development of venture capital funds. Whereas in other EESC countries venture capital legislation is still at the early stages of development, Armenia had created a public-private venture fund to support the ICT sector as early as 2013. Despite the forward-looking aspect of some policy initiatives, however, legal frameworks in Armenia remain largely outdated. The Law on Investment, for example, was adopted in 2010 to develop the national investment framework and improve financial intermediation in the business sector. It needs to be updated to improve framework conditions and create a solid foundation for the growth of innovation.

Definitions of start-ups and university spin-offs should be articulated well in the national legislation in order to enable policymakers to formulate support measures. Gaps in national legislation also include laws on technology transfer and fiscal support of procurement related to R&D and innovation (RDI). Public procurement is not perceived as a policy instrument for supporting innovation. Instead, corruption and risk management are the main foci. The Government may want to explore public procurement mechanisms that could spark innovation activities in the business sector. Caution is required, however, as public procurement frameworks may unintentionally support poor technological solutions and decrease the quality of public services. There is a danger that public procurement can provide privileged positions for local businesses and decrease their global competitiveness.

Sub-pillar I IPO evaluation and recommendations

Achievements

- ✓ The Government has recognized innovation as the national priority at the highest policymaking level.
- ✓ Armenia has made progress in fostering public sector innovation across government agencies.
 - ✓ The ICT sector is relatively strong.
 - ✓ A public-private venture fund exists to support ICT.

Sub-pillar I IPO evaluation and recommendations (Concluded)			
Area for improvement	Recommendation	Time frame	Responsibility
<ul style="list-style-type: none"> Funding of research and innovation activities is low. 	<ul style="list-style-type: none"> ✓ Increase funding for RDI, while improving the governance of government authorities responsible for science and innovation and supporting higher standards of governance in public grant recipients. 	Long-term	Government
<ul style="list-style-type: none"> Legal frameworks for innovation policy are outdated. Regulations are missing, as are terms defining the actors in innovation processes. 	<ul style="list-style-type: none"> ✓ Adopt legal acts that introduce the terms “start-up” and “university spin-offs” into policymaking. 	Medium-term	Government
	<ul style="list-style-type: none"> ✓ Update legal acts on RDI to reflect the national agenda for innovation policy and recent socioeconomic and technological trends. 		
	<ul style="list-style-type: none"> ✓ Adopt legal acts on technology transfer, to accelerate academia-industry collaboration. 		
<ul style="list-style-type: none"> Science policy is separated from innovation policy. 	<ul style="list-style-type: none"> ✓ Design holistic policy approaches that will use the multiple synergies between science and innovation policies to bridge the divide between business and academia. 	Medium-term	Government
<ul style="list-style-type: none"> Innovation policy lacks the full support of long-term planning arrangements. 	<ul style="list-style-type: none"> ✓ Introduce robust mechanisms for prioritizing research and industrial fields, to consolidate resources for strengthening national competitive advantages. 	Medium-term	Government
<ul style="list-style-type: none"> Innovation procurement frameworks are not implemented. 	<ul style="list-style-type: none"> ✓ Explore the potential of public procurement to accelerate innovation growth. 	Short-term	Government

Source: UNECE.

Sub-pillar II: innovation policy coordination

Coordinated approaches help avoid overlapping, duplicating or omitting actions required to implement innovation policy successfully.

International cooperation

Positioned between several economic and knowledge blocs, Armenia has the potential to benefit from international cooperation in science and innovation. Through its diaspora it has strong relations with many countries. In 2015, the Government signed a Trade and Investment Framework Agreement with the United States, which provides a platform for investment and economic cooperation. In 2016, Armenia acquired the status of an Associated Country with the EU's Horizon 2020 programme. That granted the opportunity for Armenian research and business organizations to compete for funding with European counterparts and explore opportunities for joint research. As of 2019, 40 such organizations had received funding from the programme. In parallel with developing collaboration with the EU countries, Armenia seeks to deepen relations with

the Russian Federation. In 2015, Armenia joined the EAEU, which supports regional cooperation across economies, financial policy, industry and agriculture. The EAEU harmonizes the technical regulations of member states, supporting the integration of enterprises into international markets. Membership opened up access by Armenian firms to the single market of the Russian Federation, Belarus, Kazakhstan and the Kyrgyz Republic. As a member of the WTO since 2003, Armenia has a liberal investment regime, making it an attractive location for international companies.

Armenia maintains collaborative efforts with leading countries in science and technology. It has signed science cooperation agreements with approximately 40 such countries in Europe, Asia and North America. Domestic research organizations contribute to such international research projects as the ALICE (A Large Ion Collider Experiment), Apparatus and Compact Muon Solenoid projects of the European Organization for Nuclear Research.

Innovation policy coordination within the central government and between national and subnational authorities

To date, Armenia has not developed mechanisms for coordinating innovation policy, so the policy landscape remains largely fragmented. Policymakers develop science and innovation initiatives in isolation, without a holistic vision. No joint working groups or specific councils exist to support joint development of innovation policy. Central and regional authorities do not coordinate with each other, and no systematic communication channels are specifically dedicated to exchanging experiences with innovation policy issues at the subnational level. Subnational units do not have innovation strategies or plans that complement the national innovation policy framework.

Sub-pillar II IPO evaluation and recommendations			
Achievements			
<ul style="list-style-type: none"> ✓ Armenia has strong linkages with many countries through its diaspora. ✓ The Government has international agreements on trade, industry and research with countries leading in science and technology as well as the EU. 			
Area for improvement	Recommendation	Time frame	Responsibility
<ul style="list-style-type: none"> • No mechanisms for coordinating innovation policy exist at the central government level. 	<ul style="list-style-type: none"> ✓ Establish a national council for coordinating innovation policy and joint working groups among ministries, to strengthen synergies among innovation policy initiatives. 	Medium-term	Government
<ul style="list-style-type: none"> • No mechanisms exist for coordinating innovation policy between national and subnational authorities. 	<ul style="list-style-type: none"> ✓ Explore opportunities to foster research and innovation activities beyond the capital region, perhaps having regional authorities support the implementation of national policy by managing infrastructure (start-up centres, technology centres) or project management offices. 	Medium-term	National and regional government

Source: UNECE.

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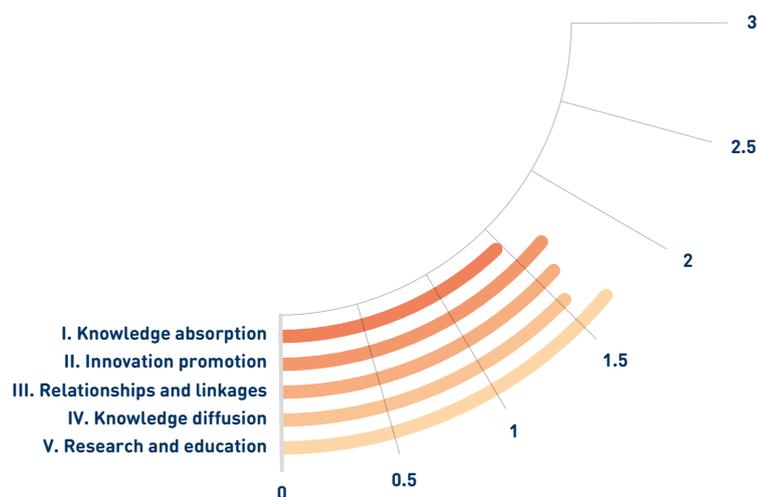
Chapter IV

PILLAR II: INNOVATION POLICY TOOLS

This chapter reviews the policy mechanisms in Armenia that enable, promote and diffuse innovation. It addresses five sub-pillars: knowledge absorption, innovation promotion, relationships and linkages, knowledge diffusion, and research and education.

National innovation policy mix – strengths and weaknesses

Figure IV.1 • Scoring of sub-pillars: innovation policy tools



Source: UNECE.

Note: The IPO pillar scoring is calculated on the basis of the average quantitative assessment of individual indicators under each sub-pillar. In the evaluation, all support measures in a given area are taken into account and special consideration is paid to indirect contributions from external mechanisms. The overall band score for each sub-pillar forms the following generalized categories: 0.0–0.5, No policy instruments/mechanisms exist; 0.5–1.5, Policy efforts are in their initial stage of development; 1.5–2.5, Policy efforts are evident and partial implementation takes place; 2.5+, Policy efforts are comprehensive and monitoring activities are systematic. The scores for individual indicators are as follows: 0, No policy instrument/mechanism exists; 1, A policy measure/s is/are under development/has/have partial or indirect impact; 2, A policy scheme/s is/are operational and implementation has started; 3, Implementation is advanced and evaluation/impact assessment is taking place. Policy measures with sector-specific or partial or non-targeted impact on a given area are subject to case-by-case evaluation. For a more detailed discussion on the IPO scoring methodology, please refer to Methodology and Process.

Innovation is among the priorities of the Government’s agenda to support sustainable development, the Development Strategy 2014–2025. The demographic and economic challenges facing Armenia (chapter I) make it increasingly important to apply effective policy support measures so as to build on the potential for productivity-driven growth. The IPO analysis of innovation policy tools identified relatively strong performance by Armenia on the sub-pillars of *Innovation promotion* and *Research and education*, as well as several areas that need improvement within the sub-pillars of *Knowledge absorption*, *Knowledge diffusion*, and *Relationships and linkages*. Recent years have shown positive developments in start-up and SME support, digitalization and education. Emerging linkages between industry and science lay the foundations of a dynamic innovation ecosystem. Significant progress has been made in ICT, in particular, with well-established international networks and support infrastructure. Overall, however, several issues remain, including overreliance on international donor support, gaps in early-stage business development and a lack of broader demand-driven policies for innovation on the domestic market, as the potential for public procurement to stimulate demand is not sufficiently explored. Thus, sustaining high levels of cross-border research cooperation and optimizing the potential of diaspora networks for science and innovation remain integral for Armenia’s transformation into a knowledge-based economy.

Table IV.1 Overview of sub-pillars and indicators for innovation policy tools

Sub-pillar I: Knowledge Absorption	Sub-pillar II: Innovation Promotion	Sub-pillar III: Relationships and Linkages	Sub-pillar IV: Knowledge Diffusion	Sub-pillar V: Research and Education
Promotion of public and private sector organizational and managerial practices	Business plan and start-up competitions	Innovation voucher schemes	Information and brokerage schemes for technology upgrading	Policies to increase the number of science, technology, engineering and mathematics graduates
Schemes to support the development of technical and business services	R&D loans	Cooperative R&D grants	Standards, testing and certification instruments for SMEs	Policies to foster research development
Fiscal incentives for acquiring knowledge capital	VAT exemptions	Supplier matching services	Industrial technology assistance programmes and extension services for SMEs	
	Technology incubators	S&T parks	Public procurement for innovation	
		Innovation spaces	Digitalization	
		Technology accelerators		
		Business networks and clusters		
		Academia-industry linkages		
		Diaspora networks		
		Gender equality		

Source: UNECE.

Sub-pillar I: knowledge absorption

The process of assimilating external knowledge plays a substantial role in developing dynamic core competencies, as well as in gaining competitive advantage and creating new value chains.

Promotion of public and private sector organizational and managerial practices

Projects to promote organizational and managerial practices in the private sector are implemented in Armenia by the Fund Investment Support Centre (ISC) (formerly the Small and Medium Enterprise Development National Centre, or SME DNC), established in 2002. Funded from the State budget, the ISC provides business services and support – including training, consultation and networking – to local companies on a competitive basis. In addition, the Republican Union of Employers of Armenia supports the implementation of ISO management standards by providing training and mentorship for SMEs and entrepreneurship development support for women. Nevertheless, the SME Development Strategy 2016–2018 highlighted weaknesses in public and private sector management (Armenia, 2015); the 2020–2024 edition of the strategy, which was approved in 2020, aims to foster the development of entrepreneurial skills.¹ Recently the Government introduced entrepreneurial learning in the curricula of primary and higher education as well as vocational education and training, according to the OECD's SME Policy Index 2020. It took these steps despite the lack of more broadly coordinated collection of data on the need to develop skills (OECD and others, 2020). According to the latest EU4Business survey of SMEs in Armenia (2018), the principal issues for business development are weak business management skills, lack of transparency and low corporate governance standards (EU4Business, 2018).

In the public sector, R&D activities are pursued mainly in public research institutes and state non-profit organizations. Quality management tools have been used more since 2015, when the Common Assessment Framework guidelines were developed as part of the “Excellence in the Public Sector” project of the EU. The Civil Service Council (the implementing body) was dissolved in 2018, and capacity-building activities are relatively new in the field. In 2018, UNDP Armenia held a public sector innovation week as part of the EU-funded “Innovation for Development” project, which supported the implementation of innovative ideas in the public sector.²

Schemes to support development of technical and business services

The development of business support services in Armenia relies mainly on donor-assisted projects in the private sector and on business consulting companies. One long-term support facility is the EBRD's «Advice for Small Businesses» project, which aims to facilitate and promote the use of business support services by SMEs in Armenia (EBRD, 2020). Following the end of that project, the SME Finance and Advice Facility was established in 2017. The ISC supports market development in business support

services by linking SMEs and private providers of technical and business services through its website and outsourcing some of its business services. Until recently, SMEs could obtain consultations for business development and for user-centred strategies for commercializing innovation through the EU4Business project “Support to the SME Development in Armenia” (SMEDA³). According to the OECD and others (2020), 23 per cent of Armenian SMEs benefited from publicly funded and co-funded business development services in 2017, the second highest share in the sub-region after Georgia (48 per cent). Yet room for improvement exists: a lack of quality assurance or reputational mechanisms, low awareness of the availability of services and limited financial resources are the main frictions in moving towards sustainable, market-based provision of technical and business services.

Fiscal incentives for acquiring knowledge capital

Fiscal stimulation for innovation is regulated in Armenia under the national tax code. It has included a support scheme for tech start-ups (with a 10 per cent tax on income and a 0 per cent tax on profit) that is scheduled to run from 2015 to 2022. Under the scheme 777 IT and high-tech start-ups have been created. Indirect incentives to innovative firms include deferral of value added tax (VAT) payments and exemptions from customs duties (for imports from non-EAEU countries) for technological equipment and capital goods imported within the scope of approved investment projects. In 2017, VAT payment deferrals amounted to approximately \$20 million, under 27 investment projects that created 1,440 jobs. Tax relief on profit tax, VAT, property tax and customs duties is granted to the residents of Armenia’s three free economic zones, including the Alliance zone in Yerevan, which hosts a number of R&D and high-tech businesses. Yet the lack of a comprehensive estimate of the total financial costs of tax incentives obstructs accurate assessment of the value of such schemes to the economy (EV Consulting, 2018).

Sub-pillar I		IPO evaluation and recommendations	
Achievements			
<ul style="list-style-type: none"> ✓ A dedicated government agency for SME development (the ISC) supports local entrepreneurs through services and capacity-building activities, while creating linkages with private providers of technical and business services. ✓ Indirect R&D support in the form of fiscal stimulation has helped create jobs and develop the IT sector in recent years. 			
Area for improvement	Recommendation	Time frame	Responsibility
<ul style="list-style-type: none"> • The policy tools for knowledge absorption do not sufficiently promote good organizational and managerial practices in the public sector. 	<ul style="list-style-type: none"> ✓ Develop a dedicated scheme for promoting organizational and managerial practices in the public sector. 	Medium-term	Office of Civil Service of the Prime Minister
	<ul style="list-style-type: none"> ✓ Provide training to public servants on the basis of assessed needs and international good practices. 		

Sub-pillar I IPO evaluation and recommendations (Concluded)			
Area for improvement	Recommendation	Time frame	Responsibility
<ul style="list-style-type: none"> The provision of technical and business services is not yet fully market-based and relies predominantly on State and international donor support. 	<ul style="list-style-type: none"> Introduce a co-financing mechanism specifically targeting technical and business services to stimulate market-based service provision. 	Medium-term	ISC
	<ul style="list-style-type: none"> Introduce quality assurance and reputational mechanisms to boost business sector development in the field and instil trust in the use of private technical and business services. 	Medium-term	Ministry of Economy
	<ul style="list-style-type: none"> Raise awareness of the availability of technical and business services and their importance for early-stage business development. 	Short-term	ISC
<ul style="list-style-type: none"> Comprehensive assessment is needed of the available targeted fiscal incentives for innovation. A comprehensive estimate of the total financial costs of tax incentives is not publicly available. 	<ul style="list-style-type: none"> Conduct a comprehensive assessment of current tax privileges to examine their effectiveness for stimulating innovation. 	Medium-term	State Revenue Committee
	<ul style="list-style-type: none"> Generate and report data on the financial costs of all tax incentives. 		

Source: UNECE.

Sub-pillar II: Innovation promotion

Promoting innovation requires governments to invest in establishing platforms where young companies can develop and test innovative ideas.

Business plan and start-up competitions

The development of Armenia's business scene is strongly supported by various donor initiatives that stimulate innovation through direct and indirect financial support (table IV.3). For instance, the EU4Business SMEDA project has supported start-ups with training, competitive grants and technical assistance. As of 2019, it had awarded Innovation Matching Grants or Science and Technology Entrepreneurship Programme (STEP) grants to 34 start-ups that were realizing technology-based projects in engineering, cleantech and high-tech. The awards included access to seed funding, mentorship and networking opportunities. Successful Start, a regionally implemented State programme, supports the establishment of start-ups in food processing and tourism. In 2018, the programme helped 238 start-ups (out of 303 participants) develop business plans; this help included training, professional consulting and financial support for the winning projects, including small business loans of approximately \$10,000. Events organized over the past several years to support the growing start-up movement include the Armenia StartUp Cup (organized by the International Academy of Business in 2016) and the Sevan Startup Summit (co-sponsored by the EU-SMEDA project in 2019), providing mentorship, grants and investor linkages.

Table IV.3 Selected support programmes for RDI

Support programme	Implementing body	Programme objective	Scheme value	Year introduced
Horizon 2020	European Union	Provide RDI funding for multinational collaboration and individual projects.	Approximately €80 billion total for all participating countries	2014
SME Competitiveness Programme	European Union	Promote an entrepreneurial culture and improve SME competitiveness.	€2.3 billion total for all participating countries	2016
Innovation Matching Grants (EU4Business-SMEDA)	GIZ PSD SC Regional Programme, EIF	Stimulate technology absorption, research commercialization and industry-science collaboration.	€30,000–50,000 per grant	2017
Science and Technology Entrepreneurship Programme (STEP) Grants (EU4Business- SMEDA)	GIZ PSD SC Regional Programme, EIF	Support the development of innovative products on the domestic and global markets.	Up to about €3,600 per grant	2018
Innovation and Regional Matching Grants (World Bank, Trade Promotion and Quality Infrastructure Project)	EIF, World Bank	Stimulate innovative development by directly funding joint innovation projects (up to 50 per cent) and regional matching grants (up to 85 per cent).	€10,000–50,000 per grant	2019
Neruzh	Ministry of High-Tech Industry	Support diaspora entrepreneurs in launching start-ups in Armenia.	Up to €259,000	2019
From Idea to Business	Ministry of High-Tech Industry	Support disruptive ideas, development of innovation, and commercialization of processes and products.	Up to €1.72 million total	2020
"Cooperation between University and the Private Sector for the Preparation of Specialists" Programme	Ministry of High-Tech Industry	Support industries that suffered the most from the pandemic, as well as reduce the gap between demand for and supply of employees with appropriate skills in the high-tech sector.	Up to €691,000 total	2020
COVID-19 grants	Ministry of High-Tech Industry	Prevent COVID-19, develop effective and innovative solutions.	Up to €193 million total	2020
Lung ventilator grants	Armenian Engineering Association	Produce lung ventilation machines.	Up to €155,300 total	2020
Government programme addressing economic impact of COVID-19	Various	Support companies registered within the last two years.		2020
Innovation Grants Programme	Ministry of High-Tech Industry	Help service companies that have been registered for more than two years to start investing in developing products.	Up to €570,000 total	2020
Experienced Companies Grants Programme	Ministry of High-Tech Industry	Support start-ups that may attract investment until December 2020 by providing 100 per cent co-financing grants of up to €54,000.	Up to €794,000 total	2020
Matching Grants programme	Ministry of High-Tech Industry	Support businesses in using innovative solutions to overcome economic difficulties.	Up to €155,000 total	2020
Support Programme: Innovation for economic recovery for micro, small and medium-size non-tech companies (EU4Business, "Innovative Tourism and Technology Development For Armenia")	GIZ PSD SC Regional Programme	Develop in companies digital and entrepreneurship skills. Hold a competition for business model presentations.	Up to € 10,000 (maximum of 15 grants)	2020
Government programme addressing the economic impact of COVID-19	ISC	Provide soft loan financing.	Up to €18,000 for start-ups Up to €35,000 for businesses with an innovative business plan	2020

Source: UNECE and Armstat (2020) for information on Neruzh and all 2020 programmes.

Support for RDI investment

Although preferential R&D loans are not yet available in Armenia, since 2009 the ISC has offered a loan guarantee provision programme covering up to 70 per cent of the loan principal, to help local entrepreneurs develop their businesses. In addition, according to the Tax Code that entered into force in 2018, scientific research that complies with the standards set by the Government is exempt from VAT (Armenia, 2016, art. 64, part 2, point 3; art. 121, part 6). Nevertheless, the level of innovation activity remains low (chapter II), and the lack of equity-based financing is among the main bottlenecks to innovation on the domestic market. Business angel and venture capital investment are scarce and relatively new to the Armenian business scene. Only two venture capital companies provide funding, expertise and network access to technology-based start-ups: SmartGateVC (founded in 2017) and Granatus Ventures (the first venture capital firm in Armenia, established in 2013 with investment from the World Bank and members of the Armenian diaspora).

Technology incubators and accelerators

A main player in innovative development and one of the largest IT development agencies in Armenia is the Enterprise Incubator Foundation (EIF), established jointly by the Government and the World Bank in 2002, within the framework of the Bank's Enterprise Incubator project. The EIF supports the development of the ICT sector, creating a productive environment for innovation, technological advancement and company growth. In addition to implementing several competitions, including the business development and innovation grant contests within the EU and World Bank projects (see table IV.3), the EIF conducts joint projects for developing innovation support infrastructure, networking and venture investment (chapter V). The Gyumri and Vanadzor Technology Centres, established by the Government and operated by the EIF with funding from the World Bank, provide incubation services for technology start-ups, mainly in IT and engineering. In 2013, UNDP and UNICEF created the Kolba Social Innovations Lab, a social venture incubator and design lab for Armenia. It mobilizes innovators and supports start-up development through events such as the Smart City Data Hackathon (2017), the Startup Cup on Education (2017) and the Innovation Challenge on Education (2017). In addition, the privately owned ViaSpere Technopark in Yerevan has provided infrastructure and incubation services to companies, mainly in the ICT sector, since 2001.

Technology acceleration programmes are relatively new to the Armenian innovation landscape, with several recently launched at technology centres, including Gyumri and Vanadzor. They mainly target local IT specialists, engineers and start-ups. The first tech accelerator was the Start-up Academy, established with the support of the EU-SMEDA project in 2017. In 2018, the Climate Change Technology Accelerator was established by UNDP Armenia and ImpactAim VA, in cooperation with the Innovative Solutions and Technologies Centre Foundation. The Founders Institute Yerevan and the EIF offer a sustainable mechanism for promoting innovation and technological solutions in climate change adaptation and mitigation activities related to agriculture and forestry. Despite these recent positive developments, the lack of a clear policy and institutional framework for technology incubators and accelerators inhibits the creation of strong linkages and coordination between separate structures. In addition, regional centres reportedly operate below full capacity, often lacking skilled workers and modern equipment.

Sub-pillar II IPO evaluation and recommendations

Achievements

- ✓ Competitive programmes for RDI have been launched across the country with the support of international organizations, stimulating start-up development and job creation.
- ✓ Several innovation and technology centres provide incubation services to start-ups, and acceleration programmes are beginning to emerge, supporting a growing start-up movement and setting the foundations of a well-functioning innovation ecosystem.

Area for improvement	Recommendation	Time frame	Responsibility
<ul style="list-style-type: none"> • Low access to finance inhibits the product development cycle of innovative projects, and the financial support instruments targeting RDI are insufficient to bridge the gap in the early stages of start-up development. 	<ul style="list-style-type: none"> ✓ Expand equity investment instruments (possibly in cooperation with international partners) to support the growth of innovative production that is based on global best practices. 	Medium-term	Relevant ministries and State authorities
	<ul style="list-style-type: none"> ✓ Introduce a diverse set of financial support instruments (such as preferential R&D loans, VAT exemptions on innovative goods and intermediary inputs) to bridge the gap in access to finance at early development stages and stimulate production of innovative goods. 		Ministry of Economy ISC Relevant state authorities
<ul style="list-style-type: none"> • The policy tools for technology incubation and acceleration are not guided by a clear policy and institutional framework, leaving service portfolios of different structures unstandardized and regional centres operating below full capacity. 	<ul style="list-style-type: none"> ✓ Improve the policy and institutional framework governing technology incubators and accelerators. 	Short-term	Ministry of High-Tech Industry Relevant ministries and state authorities
	<ul style="list-style-type: none"> ✓ Ensure regular monitoring, data collection and impact assessment of innovation support structures across all sectors of the economy. 		
	<ul style="list-style-type: none"> ✓ Consolidate a set of standards for technology incubators to improve the quality of services provided at support structures across the country, and to assist with developing the workforce and acquiring modern equipment at regional centres. 		

Source: UNECE.

Sub-pillar III: Relationships and linkages

Schemes that promote linkages between science and industries help create innovative ecosystems by assisting scientists and businesspeople in commercializing research, creating products and developing organizational processes.

Business networks and clusters

The formal platforms for business collaboration in Armenia are business associations and chambers of commerce and industries. Business networking is also supported by donor-financed private sector development projects. Furthermore, as a member of the Enterprise Europe Network, the ISC offers business matchmaking services in addition to providing information on international cooperation. Cross-sectoral and sectoral business

unions also help develop business networks; they include the Chamber of Commerce, the Union of Manufacturers and Businessmen of Armenia, the Union of Advanced Technology Enterprises and the Union of Employers of Information and Communication Technologies. A remaining issue for business unions is their limited financial resources, restricting the scope of their activities and inhibiting further development.

Sectoral and geographical clusters have been established in the creative industries (including the fashion and design and the film subsectors), as well as in engineering and start-up ecosystems (EU4Business, 2019). Stimulation of clusters occurs mostly through ad hoc projects financed by donors (such as the United States Agency for International Development, the EU and GIZ) and is also part of Armenia's export-led industrial strategy. An engineering city is being established in Yerevan, implemented by the EIF through a public-private partnership between the Government and a consortium of private companies, aiming to create an enabling environment for engineering companies in the high-tech sector.

Innovation support infrastructure

The innovation support infrastructure in Armenia consists of innovation and technology centres, focused mainly on IT and engineering. The technology parks in Gyumri and Vanadzor are among the largest elements. Their portfolios have developed over the past several years through consultancy and training programmes as well as forums and events. Other elements that support innovative development include the Innovative Solutions and Technologies Centre Foundation at Yerevan State University, as well as the Microsoft Innovation Center and the Armenian National Engineering Laboratories at the National Polytechnic University. The last two are educational and research facilities established at leading universities, by Microsoft (United States) and National Instruments (United States), respectively. Others include the IBM Innovative Solutions and Technologies Center (IBM, United States), and Regional Mobile Application Laboratories ECA (Nokia, Finland).

Academia-industry collaboration and mobility

Collaboration between research and businesses in Armenia is modest, with some pilot initiatives introduced in recent years to create industry-science linkages. Although non-competitive financial support in the form of innovation voucher schemes is not available, local scientists and technological professionals have been encouraged to collaborate with firms competitively through the STEP, jointly organized by the Government, the EIF and the United States Civilian Research & Development Foundation. In 2015, the programme's Business Partnership Grant Competition funded 5 joint projects and supported 26 individual projects in commercializing innovative ideas; applicants were required to provide 10 per cent funding from industrial counterparts. In addition, the Convergence Centre for Engineering and Applied Science – a proposed public-private partnership between international donors, educational institutions and IT companies (initiated by the TUMO Centre for Creative Technologies) – aims to increase the number and qualifications of Armenian engineers and technology professionals, as well as modernize technology education at universities. As of 2019, Armath Engineering Laboratories had been introduced in 575 schools as part of a partnership framework with the MoESCS and the Union of Advanced Technology Enterprises. A recurring issue is that researchers do not actively participate in the labour market, and no instruments for evaluating researchers have been introduced yet. Industry-science linkages

thus remain weak, with some fragmented collaboration that relies on ad hoc, donor-driven projects. In light of these shortcomings, a pilot project for developing R&D in the business sector is under development in a joint initiative of the National Center of Innovation & Entrepreneurship of the Ministry of Economy with the State Science Committee of the MoESCS.

Diaspora networks

Harnessing the potential of Armenia's large diaspora (estimated at 6–8 million people) is integral to the innovative development and sustainable growth of the economy. Indeed, the diaspora plays an important role in the economy, especially in science and technology (chapter II). Several support mechanisms exist for creating strong linkages with Armenian communities worldwide. In 2019, the Government established the Office of the High Commissioner of Diaspora Affairs to elaborate a strategy for mobilizing the diaspora potential as well as to leverage diaspora knowledge and investment for economic growth. The Armenian Trade Network, established in 2011, aims to connect Armenian chambers of commerce and business entities within the diaspora by promoting linkages within the global Armenian business community. The Foundation for Armenian Science and Technology, launched in 2016, further aims to mobilize the scientific, technological and financial resources of Armenian and international communities. In 2018 it initiated the Science and Technology Angels Network, uniting investors and entrepreneurs of Armenian descent living abroad who provide financing, consulting and mentoring to start-ups in Armenia. The non-profit global network ArmTech, a recurring event, attracts industry professionals and high-level executives from abroad to improve international cooperation with the Armenian high-tech industry. Several foreign-based diaspora organizations promote cooperation between Armenia and countries around the globe, including the Analysis Research & Planning Institute of Armenia and the Armenian Engineers and Scientists of America. In 2019, over 3,000 people across four countries participated in the Armenian Diaspora Survey. Led by a team of academics, researchers and experts, the survey provided useful data to institutional and community diaspora leaders and to policymakers in Armenia (Armenian Institute, 2019).

Gender equality

Gender equality in Armenia has been ensured by the Constitution since the country's independence (Armenia, President of the Republic, 2015). Public programmes implemented by the State Employment Agency continuously promote women's participation in the labour force, and projects on women's empowerment and entrepreneurship are supported by international donors (the United States Agency for International Development, the EBRD, the Small Business Administration and the Asian Development Bank) and local non-profit organizations, such as the Armenian General Benevolent Union.⁴ Ten Women Entrepreneurs' Clubs have been established since 2018 with EU support to empower female entrepreneurs through networking and capacity-building. The low representation of women in governance and decision-making is further addressed by UNDP Armenia, which runs several initiatives on gender equality, including Women in Local Democracy (phase 2: 2017–2019), Women in Politics (2018–2021) and Gender Equality in Public Administration in Armenia (2019–2020). Moreover, according to the ICT statistics registry run by the Ministry of High-Tech Industry, about 40 per cent of Armenian women are involved in high-tech – a high rate both across the EESC sub-region and beyond. Despite these positive results,

issues remain, such as the low participation of women in the labour market, with 40 per cent of women with tertiary education unemployed and a persistent gender pay gap (20 per cent as of 2019).⁵ Combining work and family life poses continuous difficulties (48 per cent of unemployed women cited family responsibilities as a reason).

Sub-pillar III IPO evaluation and recommendations

Achievements

- ✓ Armenia has developed infrastructure that supports innovation in the ICT and engineering sectors, providing a range of services, facilities and modern equipment to start-ups and innovative companies.
 - ✓ Competitive financial incentives for industry-science collaboration have been introduced with international donor support.
 - ✓ Well-established diaspora networks participate in developing the innovation, science and technology fields in the country.

Area for improvement	Recommendation	Time frame	Responsibility
<ul style="list-style-type: none"> • Business and innovation networks are not sufficiently well developed and lack matching services to support SMEs with limited capacities and resources. 	<ul style="list-style-type: none"> ✓ Introduce supplier matching services to facilitate business linkages and accelerate innovation, benefiting both buyers and suppliers on the domestic market. 	Medium-term	Ministry of Economy Other relevant ministries and authorities
	<ul style="list-style-type: none"> ✓ Develop a framework for developing clusters to stimulate technology transfer, networking and information dissemination in priority sectors. 	Short-term	Other relevant ministries and authorities
<ul style="list-style-type: none"> • Industry-science collaboration and mobility are weak, obstructing the creation of linkages, with public research institutions often working in isolation from the private sector. 	<ul style="list-style-type: none"> ✓ Introduce direct incentives for industry-science collaboration in the form of an innovation voucher scheme, to create linkages between Armenian businesses, researchers and education institutions. 	Medium-term	MoESCS State Science Committee Other relevant ministries and authorities
	<ul style="list-style-type: none"> ✓ Introduce support tools for evaluating researchers and improving mobility between academia and industry (such as traineeships, internships and vocational programmes) to create synergies between fundamental and practical knowledge and to meet industry needs. 	Short-term	MoESCS State Science Committee Other relevant ministries and authorities
<ul style="list-style-type: none"> • The elements of the innovation infrastructure do not sufficiently support linkages and innovative business development in sectors other than ICT and engineering. 	<ul style="list-style-type: none"> ✓ Develop a long-term framework for developing innovation infrastructure. 	Short-term	Ministry of Economy Other relevant ministries and authorities
	<ul style="list-style-type: none"> ✓ Conduct a comprehensive assessment of infrastructure elements and identify investment priorities, ensuring that support for innovation is provided in all sectors. 		
	<ul style="list-style-type: none"> ✓ Consider supporting the establishment of a science and technology park (possibly in cooperation with partner organizations) to support the development of technological entrepreneurship and create conditions for realizing their science and industrial potential. 	Medium-term	EIF
<ul style="list-style-type: none"> • Despite some positive developments, issues in gender equality persist, including low female labour-force participation and a gender pay gap. 	<ul style="list-style-type: none"> ✓ Mainstream gender equality principles at all stages of the policymaking process, ensuring that gender-disaggregated data collection and regular assessment are implemented to identify areas of intervention. 	Short-term	Relevant ministries and authorities

Source: UNECE.

Sub-pillar IV: Knowledge diffusion

Mechanisms that ensure equal and widespread access to information are vital to creating an innovative ecosystem in both the public and the private sector, serving as channels for the distribution and intersectoral flow of information.

Standards, testing and certification

The National Institute of Standards gives an annual award in the field of quality of products and services. The Institute's laboratory has modern equipment for testing foodstuffs, radio and electronic equipment, petroleum products and chemicals, and its training centre certifies experts in standardization and conformity assessment. A web portal provides one-stop access to ISO standards and publications. A main issue in Armenia is the low awareness of ISO standards, especially in rural areas, and the importance of quality certification for the competitiveness of Armenian businesses. Instruments for standards, testing and certification of SMEs have not yet been put in place.

Digitalization and e-governance

The Armenian economy has achieved high connectivity over the past several years, with 96 per cent of households and 83 per cent of SMEs having internet access. In 2015, the project "Supply and Installation of Wireless Internet Access Devices in Villages of Republic of Armenia" – implemented by the Government with the EIF and the World Bank – provided free internet access in 344 rural areas. In addition, the Digital Transformation Agenda of Armenia 2030 includes a series of short-term programmes for creating smart e-government, developing a digital labour force and enhancing cybersecurity, as well as large-scale investment for expanding the digital infrastructure to improve the quality of connectivity and stimulate SMEs to take advantage of digital opportunities. The Ministry of High-Tech Industry has developed a new Digitalization Strategy, now under discussion with relevant stakeholders.

Moreover, specialized infrastructure for delivering IT-related training and R&D programmes is provided at several centres, including the Armenian-Indian Centre for Excellence in ICT (at Yerevan State University), which contains a high-performance computing facility; the Sun Microsystems Development and Testing Laboratory; the CISCO Systems Network Academy; the Artsakh Information Technologies Centre; and the Regional Mobile Applications Laboratory for ECA.

Other policy tools

The policy tools in place in Armenia do not sufficiently address present gaps of knowledge diffusion with regard to leveraging the potential of industrial technology assistance, public procurement for innovation or brokerage schemes for upgrading technology. Nevertheless, these tools provide indirect support in industrial technology assistance through ad hoc, donor-driven projects (see table IV.3) as well as support mechanisms provided by the Centre for Agribusiness and Rural Development, with the support of the Food and Agriculture Organization, to mitigate development gaps in the dairy industry, such as the use of outdated technology and processes.⁶

Sub-pillar IV IPO evaluation and recommendations

Achievements

- ✓ Start-ups and SMEs receive Information and brokerage services for technology upgrading from the ISC and various support programmes funded by international donors.
- ✓ The Government has successfully implemented digitalization projects in recent years, expanding broadband access and use across the country, and IT and high-performance computing centres are training highly skilled professionals in the ICT sector.

Area for improvement	Recommendation	Time frame	Responsibility
<ul style="list-style-type: none"> • The policy tools directed at diffusing knowledge within the economy do not sufficiently address the issue of low innovation activity in the private sector. 	<ul style="list-style-type: none"> ✓ Stimulate innovation on the demand side by using public procurement to create a competitive advantage for innovative entrepreneurship while modernizing public services. 	Medium-term	Ministry of Finance
	<ul style="list-style-type: none"> ✓ Launch pilot procurement schemes in priority sectors and integrate procurement of innovative solutions in competitive funding schemes. 	Short-term	
	<ul style="list-style-type: none"> ✓ Adopt a pre-commercial procurement approach. 	Medium-term	
<ul style="list-style-type: none"> • Standards, testing and certification instruments in place do not sufficiently support SMEs in developing a systemic approach to incorporate new technologies and techniques into their business operations. 	<ul style="list-style-type: none"> ✓ Lead an awareness-raising campaign regarding ISO quality certification to enhance the competitiveness and growth of SMEs. 	Medium-term	National Institute of Standards ISC
<ul style="list-style-type: none"> • Support measures in place do not sufficiently address gaps in industrial technology assistance. 	<ul style="list-style-type: none"> ✓ Expand the innovation support services by introducing industrial technology assistance in the portfolio of infrastructure elements supporting innovation. 	Short-term	Ministry of Economy Other relevant ministries and authorities
	<ul style="list-style-type: none"> ✓ Introduce a co-financing mechanism to stimulate market-based service provision. 		

Source: UNECE.

Sub-pillar V: Research and education

Recognizing the requirements of today's labour markets and rapidly evolving technological environment, governments have pursued a multidisciplinary approach to education through STEM initiatives. Policy measures to enhance research are designed to promote research excellence, collaboration and commercialization.

Policies to increase the number of STEM graduates

Reforms are being introduced in all aspects of Armenia's education system (school management, teaching staff, educational programme, teaching and learning materials, and assessment tools), aiming at bridging the gap between educational outputs and labour-market needs. In addition, an edtech (education and learning technology) and modern teaching approach has been launched in a pilot region as part of the project "EU4Innovation in Armenia: Enhanced Education" focusing on STEM (2017–2020), funded with €26.1 million by the EU and the TUMO Foundation. The project is establishing an education centre for STEM students of HEIs to gain hands-on, practical experience in their fields. In 2020, the American University of Armenia and the United States Embassy launched STEM Education for Armenian Youth, a three-year programme of teacher training sessions and a student summer camp.

Policies to foster research development

The State Committee of Science channels approximately €25.4 million in funding to research in Armenia each year, representing 0.2 per cent of GDP. It bases the budget allocation on the priorities defined by the Development Programme of the Republic of Armenia's Scientific and Technical Field for 2015–2019 (EC, 2019).

The pool of researchers is shrinking. According to the Horizon 2020 Background Report, the number of researchers dropped by 12 per cent over 2010–2017 because of three factors: the ageing population, emigration and the low investment in R&D (EC, 2019).

The largest research institution in the country is the National Academy of Sciences, which comprises 34 research institutes across several scientific divisions (Mathematical and Technical Sciences, Physics and Astrophysics, Natural Sciences and Chemistry, and Earth Sciences). Scientific initiatives between 2014 and 2020 have included the launch of a Centre of Excellence of Applied Biology (in 2015) and a Laboratory of Molecular Genetics (in 2017) at Yerevan State University. An issue consistent with the sub-regional trend is the low level of involvement of researchers in the private sector (chapter V).

Armenia is well integrated into the international research community. Through continuous and close cooperation, over 400 projects have been funded by the International Scientific and Technical Centre since 1994. As of 2020, the State Committee of Science has eight active bilateral programmes – with Belarus, Bulgaria, France, Italy, and the Russian Federation. Armenian SMEs and scientific institutions have also been introduced to European research networks through participation in Horizon 2020, the EU funding scheme for innovation and research. As of 2019, the programme had implemented 25 joint projects (EC, 2019).

Sub-pillar V IPO evaluation and recommendations

Achievements

- ✓ Large-scale education reforms aim at building a modern education system that responds to labour-market needs.
- ✓ Cross-border research cooperation is maintained through joint collaborative projects and memberships in international research programmes.

Area for improvement	Recommendation	Time frame	Responsibility
<ul style="list-style-type: none"> • Direct incentives for students to enrol in STEM-related fields are limited. 	<ul style="list-style-type: none"> ✓ Introduce a set of direct incentives for tertiary STEM education (such as excellence programmes, scholarships, and partial and full tuition fee coverage) to increase the number of students enrolling in STEM-related fields at HEIs. 	Medium-term	MoESCS Other relevant ministries and authorities
	<ul style="list-style-type: none"> ✓ Draw on international cooperation in science and education to enhance STEM education through international knowledge transfer (for example, through STEM exchange programmes, conditional support for STEM degrees at foreign HEIs). 	Short-term	
<ul style="list-style-type: none"> • Limited financial and human resources constrain the stimulation of research in the public sector. 	<ul style="list-style-type: none"> ✓ Provide attractive professional opportunities to young scientists. 	Medium-term	MoESCS State Committee of Science
	<ul style="list-style-type: none"> ✓ Introduce incentives at public research institutions to make research an attractive career choice, ensuring a balanced income system and diverse career options. 		

Source: UNECE.

Notes

- ¹ Ministry of Economy, The 2020–2024 strategy for development of the small and medium-size entrepreneurship and its resulting 2020–2022 action plan were approved, 27 August 2020.
- ² Kolba, Public Sector Innovation Week 2018, 24 January 2018, <http://kolba.am/events/public-sector-innovation-week-2018>.
- ³ The project, which ran from 2016 to 2019, was co-funded by the EU and the German Federal Ministry for Economic Cooperation and Development and implemented by the GIZ Private Sector Development, South Caucasus, Regional Programme, in cooperation with the EIF.
- ⁴ Constantine, Laura L., Yes W.E. Can – Empowering Armenia’s women through a cycle of support, Armenian General Benevolent Union, 1 August 2018.
- ⁵ World Bank, Infographic – Gender Wage Gap in Armenia, 7 March 2019, <https://www.worldbank.org/en/news/infographic/2019/03/07/gender-wage-gap-in-armenia>.
- ⁶ CARD (Center for Agribusiness and Rural Development) (n.d.), The last technical assistance project directed to dairy sector development in Armenia and Georgia, <http://card.am/en/categories/1/projects/16>.

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- Engineering City: <http://engineeringcity.am>
- EIF (Enterprise Incubator Foundation), Projects: <http://www.eif.am/eng/projects>
- ImpactAIM, UNDP Armenia, CCTA | Climate Change Technology Accelerator '18: <https://impactaim.com/accelerators/ccta-climate-change-technology-accelerator-18>
- Small and Medium Entrepreneurship Development National Centre: <https://smednc.am>
- UNDP Armenia. Women's economic empowerment in the South Caucasus: https://www.am.undp.org/content/armenia/en/home/projects/women_s-economic-empowerment-in-the-south-caucasus-
- Union of Manufacturers and Businessmen of Armenia: <http://umba.am/hy>
- Union of Advanced Technology Enterprises: <https://uate.org>

Chapter V

PILLAR III: INNOVATION POLICY PROCESSES

Pillar III examines the underlying processes for innovation policymaking: how data, evidence and stakeholder input inform how decisions are made, put into practice, monitored and evaluated. Ten detailed policy indicators address each step in the policy process, from problem identification or market failure to policy design, implementation, evaluation, impact assessment and learning.

In consultation with Armenia's Ministry of High-Tech Industry and the State Committee of Science, UNECE selected the Law on State Support for the Information Technology Sphere (IT Law) to assess under Pillar III, on the basis of these criteria:

- i) The policy measure is intended to foster science, technology and innovation (STI) in the country.*
- ii) The policy measure reflects the standard innovation policy practices in the country.*

Pillar III also looks at a specific innovation policy in depth, deriving broader policy lessons for innovation policymaking.

Innovation policy processes – strengths and weaknesses

Armenia has reformed its public administration system significantly in recent years, making important strides toward greater consistency with principles of democracy and free market relations. The strategic framework of public administration reform is unfinished, however, and the quality of the strategies is weak. Within the main line ministries in charge of innovation policy, the system for designing, developing and coordinating policy is still not fully functional. Gaps in the practices of planning and making policy affect their quality and hence the country's innovation performance.

Policies overall: progress and gaps

Government policies and interventions, including laws, play key roles in the development of the IT sector in economies, including those in transition. China, for example, under the Policies for Encouraging the Development of Software Industry and Integrated Circuit Industry framed by the State Council, recently applied a maximum tax rate of 10 per

cent for key software enterprises identified by the State instead of the normal rate of 30 per cent. Those that import capital equipment and technology (including software) are exempt from customs duties and VAT on imports. The degree of direct involvement varies across economies, with some governments adopting a facilitative approach and others opting for direct interventions. Among the latter are fiscal policies that offer financial concessions and benefits to players in the IT sector, like Armenia's IT Law. A study by the World Bank's InfoDev programme identified some success factors for designing and implementing fiscal policies to support the IT sector (box V.1).

Box V.1

Potential success factors in designing and implementing policies to support the IT sector

- Establishing the proper institutional mechanisms is integral to effective implementation. Most countries have attempted to achieve this by constituting nodal organizations within government that provide "single-window services" for beneficiary companies.
- Sound coordination between the departments and ministries administering the subsidies and incentives has been ensured through efficient e-governance systems.
- All successful countries have policy and regulatory regimes that encourage trade and investment linkages with other economies. Such linkages are usually facilitated through policy instruments that include liberal FDI guidelines, non-restrictive visa and work permit procedures, unrestricted trade in goods and services, and double-taxation avoidance agreements.
- In countries that encourage IT software development to put to use its low-cost, educated human resources, such as Armenia, the government needs to improve the legal system to protect and promote proprietary knowledge, as this is often a company's main business asset. As such, laws relating to intellectual property and the implementation of such laws are critical to gaining investor confidence.
- It is also critical that governments focus on providing such incentives not only to IT companies, but also to supporting sectors that provide, for example, physical infrastructure such as transportation, telecommunication and real estate players.
- Although in many countries, government institutions and organizations play a direct role in facilitating development of the sector in the initial stages, they have shifted to a facilitation role once the sector attains critical mass, with much of the subsequent growth initiatives led by the private sector.

Source: InfoDev (2018), pp. 53–70.

In November 2017, Armenia and the EU signed a new Comprehensive and Enhanced Partnership Agreement, identifying public administration as one of the key targets of domestic reforms. In April 2018, a Constitutional reform entered into force, transforming the political system from semi-presidential to fully parliamentary and requiring changes in laws regulating the organization and operation of State institutions (ECEAP, 2018; SIGMA and OECD, 2019).

Overall principles and rules in public administration have been formulated on the basis of criteria in EU member states. Established principles define key components of good governance, such as predictability and reliability, transparency, accountability and effectiveness, based on the rule of law. In addition, the new Law on the Civil Service meaningfully expanded the scope of the civil service (ECEAP, 2018; SIGMA and OECD, 2019).

Nevertheless, the public administration system does not yet fully comply with EU standards and relies heavily on support from international actors. The strategic framework

of public administration reform is unfinished, and the quality of the strategies is weak. Certain special groups of public servants and top-level positions are still excluded from the Law on Civil Service, and corruption is still widespread (ECEAP, 2018; SIGMA and OECD, 2019).

Policy focus: IT Law

Armenia's IT Law of 2014 aims to encourage the creation of start-ups and new jobs in the IT sector through tax benefits that are attractive but may have distortionary effects. In conjunction with related amendments to the tax legislation, the law defined tax privileges for newly established and start-up entities, including taxes of 0 per cent on profit and 10 per cent on income.

Concretely, the law pursues three objectives:

1. Raise competitiveness.
2. Involve skilled workers and continuously improve skills by providing competitive wages.
3. Implement research projects through grants and support for establishing start-ups.

Within the framework of the law, the following economic entities receive State support:

- Start-up business entities engaged in entrepreneurial activity in IT
- Economic entities engaged in implementing innovative and up-to-date IT
- Infrastructure that facilitates sector development, including techno-parks, techno-centres, incubators and accelerators
- Business entities implementing educational and research programmes in IT

The certification of beneficiaries is carried out by a commission established by the Government. Applications for issuance of a certificate are denied if the entity applying does not meet the requirements under this law. To ensure a unified approach and reduce the risk of tax evasion, benefits are available until 31 December 2022.

The law has been operationalized successfully, and uptake of the law's benefits has been significant. But its preparation was not fully evidence-based and the monitoring of impacts is incomplete, with both processes ignoring the potentially distorting effects of the benefits offered under the law.

Table V.1 Overview of sub-pillars and indicators for innovation policy processes

Sub-pillar I: Preparation	Sub-pillar II: Design	Sub-pillar III: Implementation	Sub-pillar IV: Post-implementation
Innovation foresight	Planning	Amendment of policies	Ex-post evaluation
Rationale	Decision-making	Review of the policy against its action plan	Adaptation
	Private sector consultation		
	Coherence		

Source: UNECE.

Sub-pillar I: Preparation

Sound preparation of policies sets the foundation for the policymaking process. Public intervention should depend on the identification of market failures as well as future trends that will affect the area of intervention.

Innovation foresight

Innovation foresight – the practice of capturing future trends and perspectives for research activities that are subsequently incorporated or adjusted in innovation policies – is not yet integrated into the Armenian process of making innovation policy or other policies in a systematic and continuous manner. It does take place but tends to be ad hoc, tied to specific policy design efforts – such as the Development Strategy 2030 – and not subject to continuous revision. This state of affairs means that policies such as the IT Law may not be grounded in agreed, realistic assumptions from which key performance indicators follow in some fashion, and that it is not possible to monitor and evaluate impacts in a concerted fashion.

Policy rationale

No market failure analysis was conducted by the former Ministry of Economic Development and Investment, the institution responsible for drafting the IT Law; instead, the rationale was to implement the Government’s strategic vision of supporting small companies and start-ups engaged in developing products by reducing their tax burden. The law also aimed to make the tax system “competitive” in the sub-region for IT companies. In addition, the Government expected that this tax incentive would reduce the number of businesses (individuals or groups of specialists) operating without a State registration.

The main analytical document underpinning the preparation of the IT Law was a benchmarking analysis of relevant tax rates in 18 countries of Central and Eastern Europe, and the Caucasus. It provides information on the rates of the main tax types (VAT, profits and income), as well as incentives related to R&D, workforce development and free or special economic zones. The summary of the benchmarking analysis was circulated among key stakeholders with the draft of the law.

Not conducting a comprehensive market failure analysis when the IT Law was conceived was a questionable approach, given that subsidies are efficient only when they correct an identified market failure, bringing social and private costs and benefits into alignment (WTO, 2006). Inefficient subsidies can be extremely expensive for governments: by directing resources away from other legitimate priorities they ultimately reduce the fiscal health of the government and undermine investment decisions, distorting competition and reducing the pressure on businesses to become more efficient.

During its preparation the law underwent regulatory impact assessment (RIA), including for SME impact, competition and the business environment. At that time all laws required an RIA, but RIA practices were rudimentary. They were conducted as formalities, without substantial analysis or use of quantitative and qualitative assessment tools.

Broader policy issues

Since 2014, the Government has introduced a number of governance and public administration reforms, but the quality of policy and legal planning remains limited. Such planning lacks properly defined policy objectives, outcome-level indicators and detailed cost estimates. In particular, insufficient attention is dedicated to ensuring that policies are affordable (SIGMA and OECD, 2019). The legal framework for preparing policy is in place, but in practice policymakers do not fully comply with the requirements and standards for evidence-based policymaking. Regulation of the conduct of impact assessments is in a transitional phase. The quality of RIAs remains low across the main ministries in charge of designing innovation policy (SIGMA and OECD, 2019). For instance, the law on legislative drafting adopted in 2018 entailed changes in the approach to developing RIAs. A centralized impact assessment has replaced the decentralized approach, where line ministries assessed the impacts of legislation. Yet, the detailed rules of that centralized assessment have not been adopted, so evidence-based substantiation of legislation is also in transition (SIGMA and OECD, 2019).

Sub-pillar I IPO evaluation and recommendations

Achievements

- ✓ The legal framework for preparing policy is in place.
- ✓ The Government has adopted a new law on drafting legislation.

Area for improvement	Recommendation	Time frame	Responsibility
<ul style="list-style-type: none"> • Innovation foresight is not yet integrated systematically and continuously into policymaking. Foresight tends to be ad hoc and tied to specific policy design efforts. Individual measures may not be grounded in agreed, realistic assumptions from which KPIs follow, and it is not possible to monitor and evaluate impacts in a concerted fashion. 	<ul style="list-style-type: none"> ✓ Integrate innovation foresight practices into the policy processes of relevant line ministries, to capture future trends in and perspectives on research activities for incorporation in the long-term strategic direction of innovation development. 	Medium-term	Ministry of Economy MoESCS Ministry of High-Tech Industry
<ul style="list-style-type: none"> • Evidence-based policymaking is not yet fully established, and the quality of the analysis supporting new policies and laws is low. 	<ul style="list-style-type: none"> ✓ Build on efforts and experiences with RIAs by implementing the timeline and plan to institutionalize them, to ensure that drafters use evidence-based policymaking systematically when creating policies and laws, particularly those that create subsidies. ✓ Ensure continuous development of the capacity of line ministries to conduct broad and comprehensive RIAs, as well as to create high-quality legal drafts (SIGMA and OECD, 2019). 	Medium-term	National Centre for Legislative Regulation Office of Government

Source: UNECE.

Sub-pillar II: Design

Public-private consultations are an integral part of the policy design process, to ensure policy relevance to the market and private sector needs and to confirm the commitment of relevant stakeholders to its implementation. Innovation policy is a supplementary component of a country's overarching strategy that contributes to the achievement of the broader vision and objectives of socioeconomic development. Its priorities and activities should be consistent and coherent with relevant "non-innovation" policies.

Planning

During the preparation of the IT Law, Armenia had no active innovation strategy to align the law with. The concept of IT sector development, approved by the Government in 2008, was in force, yet no reference to this document appears in the text of the law or in the justification for it. More generally, central planning documents are not fully aligned with each other, and reports on the implementation of central planning documents are not broadly available for public inspection (SIGMA and OECD, 2019).

Public-private consultation

The evidence points towards broad and open consultations during the design of the IT Law. This is typical for policy design practices in Armenia, which are generally quite open, relative to most of its peers in the sub-region. The Ministry of Economic Development and Investment, which coordinated the design of the law, conducted a broad consultative process by engaging stakeholders from the private sector, non-governmental organizations and civil society, and – importantly – the SME and IT communities. During UNECE field missions throughout 2019, the EIF, various SME associations, the Union of Advanced Technology Enterprises and the Business Support Office all confirmed that they participated actively in these consultation processes. Although the process was open, stakeholders voiced criticism about the lack of mechanisms to effectively ensure that their views were taken on board and integrated into the legislative draft: concerns about adopting a law that subsidizes a group of companies without a comprehensive market failure analysis were reflected by a range of stakeholders.

The draft IT Law was circulated among relevant state bodies for their agreement until it was adopted by the Government, following the Government rules that before submission to the Government all legal acts be sent to relevant government bodies to obtain their consent. For this particular law, the consent of the Ministry of Finance, the Ministry of Transport and Communication, and the Ministry of Justice was mandatory and was obtained after well-structured consultations.

Broader policy issues

Public scrutiny of government work and participation in policy design, including across ministries responsible for STI policymaking, are more open in Armenia than in its peers in

the EESC sub-region. Legislation is available online and free of charge; however, the central registry of regulation is not updated systematically (SIGMA and OECD, 2019).

According to the Rules of the Government, the rationale for adopting a policy must be published online during the policy design phase, with the policy draft (SIGMA and OECD, 2019). The results of public discussions must be reported to the Government in a summary note describing the comments received and how they were included in the draft. If comments were not included, the reasons for not accepting them need to be stated. The results must also be published online with the amended version of the draft act within 15 days of the end of the consultations (SIGMA and OECD, 2019, p. 43).

In accordance with the 2018 Law on Legal Drafting, the Government developed and adopted new rules of public consultation. They prescribe mandatory consultations at the end of the policy development process, after drafts have been written – which is late in the process – and do not make general advance notice of consultations obligatory (SIGMA and OECD, 2019). Ministries apply these rules inconsistently.

Policy coherence

According to the government rules, interministerial consultations are required to last for five working days, other than those with the Ministry of Justice, which gets 15 working days for review by State legal experts (SIGMA and OECD, 2019). The ministries of Finance and Justice must always be consulted, in addition to all institutions affected by the policy. In practice, interministerial consultations are carried out consistently and adhere to the required deadlines (SIGMA and OECD, 2019). Mechanisms exist for resolving conflicts during interministerial consultations is continuously developed (SIGMA and OECD, 2019) – a positive and unique development in the sub-region.

Procedures for developing policy *within* ministries in charge of STI policymaking are not clearly defined and regulated. Policy drafts are shared between departments on an ad hoc basis only when considered necessary. Existing procedures and rules therefore do not ensure that all relevant departments within ministries are consulted consistently and involved in developing policy proposals. The lack of intraministerial consultation is likely to lead to missed opportunities for synergies between departments.

The analysis found no evidence of systematic training efforts on drafting policy for civil servants in ministries responsible for STI policies.

Sub-pillar II IPO evaluation and recommendations

Achievements

- ✓ Broad and open consultations took place during the design of the IT Law.
- ✓ Well-structured interministerial consultation occurred during the design of the IT Law.
- ✓ Government rules about public consultations during the policy design process are clear and sensible.
 - ✓ Interministerial consultations are carried out consistently across ministries in charge of STI policymaking and generally meet the required deadline.
 - ✓ Mechanisms exist for resolving conflict during interministerial consultations.

Sub-pillar II IPO evaluation and recommendations (Concluded)			
Area for improvement	Recommendation	Time frame	Responsibility
<ul style="list-style-type: none"> There is a lack of coherence between laws and sector strategies and central planning documents. 	<ul style="list-style-type: none"> ✓ Consider building coherence mechanisms into the legislative design process, that ensure that laws and sector strategies are aligned with overarching, central planning documents. 	Medium-term	Office of the Prime Minister
<ul style="list-style-type: none"> The central registry of regulation is not kept fully up to date. 	<ul style="list-style-type: none"> ✓ Keep the central registry of legislation updated (SIGMA and OECD, 2019). 	Short-term	MoJ
<ul style="list-style-type: none"> Ministries are inconsistent in abiding by the government rules on public consultations. 	<ul style="list-style-type: none"> ✓ Certify the that the capacity of ministries to conduct meaningful and effective public consultations is continuously developed (SIGMA and OECD, 2019). 	Medium-term	Office of the Prime Minister
<ul style="list-style-type: none"> Procedures are not yet established for developing policy within ministries in charge of STI policymaking. 	<ul style="list-style-type: none"> ✓ Establish mechanisms to ensure that relevant departments within ministries are consulted during the policy design process. 	Medium-term	Office of the Prime Minister

Source: UNECE.

Sub-pillar III: Implementation

Targets and time frames defined in the action plan provide a basis for regular reviews of implementation progress. Analysis of intermediate progress helps identify administrative, institutional and technical challenges faced during implementation and makes it possible to undertake necessary measures, including adjusting activity and reallocating resources.

Amendments of policies

Two amendments to the IT Law were passed in 2017 and 2019. The major change in 2017 was expanding the eligibility criteria to allow company branches to apply for tax privileges and defining the five-year period for the privileges. The 2019 revision extended the deadline until 1 December 2022. Each revision refined the eligibility criteria and activity fields of eligible companies.

Review of the policy against its action plan

The IPO analysis found that the operational part of the IT Law has been commendable: its content and privileges were widely and diversely promoted, application details were structured with comprehensive and clearly drafted guidelines and the application process was managed by a dedicated commission. Uptake of the of the incentives in the law and registrations of new businesses since 2014 have been impressive. Interviews with start-ups confirmed that one of the most important benefits for success was the tax reduction on the equity financing they received from investors. Indeed, many of the start-ups would not have been able to survive had their investment been taxed at the full rate.

Broader policy issues

In addition to the IT Law, the Armenian Government has deepened previous efforts in complementary areas, including foreign trade, investor protection and property registration (EIF, 2015). As mentioned earlier, it is important to couple incentives for IT companies with trade and investment incentives and to develop support sectors in parallel, such as property development. The Government has also been implementing the Programme of Activities in Support of Improved Business Environment, which aims to facilitate and streamline the administrative procedures required for starting and developing a business (EIF, 2015).

Sub-pillar III

IPO evaluation and recommendations

Achievements

- ✓ Implementation of the IT Law is advanced and on track with the action plan.
- ✓ The operational part of the IT Law has been positive.
 - ✓ Adjustments to the law have been sensible.
- ✓ The Government has implemented legal measures that are complementary to the IT Law.

Source: UNECE.

Sub-pillar IV: Post-implementation

Ex-post evaluation is completed after the implementation of the action plan and based on results rather than forecasts. It helps establish the impact of policy activities on the industry in general, on specific fields or on beneficiaries. In light of experience acquired during implementation, governments then introduce necessary adjustments to innovation policy measures so as to better target new or established policy objectives.

Ex-post evaluation

The IT Law is still being implemented, so this sub-pillar can be assessed only in part. For the revision of the law and the extension of the tax incentives period, the Ministry of Transport and Telecommunication evaluated the impact and results on the basis of information it collected by monitoring beneficiary companies. It appears that the evaluation report examined the impact of the tax incentives, based on a relatively simple results assessment, using data on turnover, employment and exports from beneficiary companies. The IPO analysis found that the ministry did not collect evidence from a comparable group of non-beneficiary firms or conduct any other form of evaluation to verify the potential distorting effects of the subsidies offered to IT companies. The analysis also found no evidence of an exit strategy.

Broader policy issues

Overall, monitoring and evaluation in the Government is still insufficient and overly focused on outputs, with few systemic linkages to ensure that learning feeds into the policy design process, including in government bodies responsible for STI policy. Limited evidence was found of any type of impact assessment of innovation policies across relevant ministries. For details on the lack of monitoring and evaluation of innovation policies and measures, see chapter IV.

Sub-pillar IV IPO evaluation and recommendations			
Achievements			
✓ An impact evaluation of the IT Law was conducted.			
Area for improvement	Recommendation	Time frame	Responsibility
<ul style="list-style-type: none"> The evaluation of the IT Law was limited. 	<ul style="list-style-type: none"> ✓ Collect data from a comparable group of non-beneficiary firms, and conduct an evaluation to verify the potential distorting effects of the subsidies offered to IT companies. 	Short-term	Ministry of High-Tech Industry
<ul style="list-style-type: none"> Monitoring and evaluation is insufficient and overly focused on outputs, with few systemic linkages to ensure that learning feeds into policy design. 	<ul style="list-style-type: none"> ✓ Implement RIAs systematically to enhance the quality of the flow and stock of laws and policies, especially in light of the scarcity of monitoring, evaluation and impact assessment in the policymaking process. 	Medium-term	Line ministries
<ul style="list-style-type: none"> Monitoring and evaluation have only a tenuous link with policy design. 	<ul style="list-style-type: none"> ✓ Establish a more systemic linkage of monitoring and evaluation to policy design, including in government bodies responsible for STI policy. 	Medium-term	Line ministries and implementation agencies

Source: UNECE.

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