Towards SMART Armenia
Strategic approach on the development of the innovation ecosystem

Summary of working results of EU-SMEDA –
Technical support to Ministry of Economic Development and Investment for development of a comprehensive Government strategy and action plan to foster innovation with a special focus on SMEs

2017-2018
Development of strategic approach fostering innovation in Armenia – support set-up (phase 1)

**Assessment of status quo**

- Innovation Ecosystem Analysis
  - Desktop study, Interviews, Workshops,
  - Analysis of Status quo & Identification of challenges and opportunities

**Develop of vision & directions**

- Development of Innovation Strategy
  - Stakeholder discussions, Workshops
  - Development of strategy approach

- Innovation Strategy draft
  -Cross-cutting strategic approach (incl. logic of change, implementation road map and envisaged budget

**Participative planning**

- Implementation plan
  - Public private dialog, Project development workshops

- Implementation Blueprint
  - Analysis of Status quo & Identification of challenges and opportunities

- Consortia & Project agendas
  - Set-up of strategy implementation (incl. main implementing agents and governance)

**Phase 1 EU-SMEDA support**
Innovation: an imperative for future competitiveness, quality jobs and for addressing social and environmental challenges

An **INNOVATION IS** the implementation of a new or significantly improved **PRODUCT** (good or service),
or **PROCESS**, a new **MARKETING METHOD**, or a new **ORGANISATIONAL METHOD** in business practices, workplace organisation or external relations.

Source: OECD/Eurostat, 2005

Source: World Bank
Armenia’s innovation system performance gives ground for optimism but significant gaps need closed to reach a ‘higher grade’ (GII 2017)

Armenia’s overall rank in 2017 among 141 countries

Benchmark with EAEU countries

Benchmark innovation-based fast growth countries

Towards SMART Armenia
Relative performance and trends are highly uneven with some strengths but as many weaknesses in national innovation system

Armenia’s overall GII position:  59

<table>
<thead>
<tr>
<th>GII Pillars</th>
<th>GII 2013</th>
<th>GII 2017</th>
<th>Strengths</th>
<th>Weaknesses</th>
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</thead>
<tbody>
<tr>
<td>1. Institutions</td>
<td>57</td>
<td>63</td>
<td>Labour market flexibility</td>
<td>Rule of law</td>
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<td></td>
<td></td>
<td></td>
<td>Ease of starting business</td>
<td>Government effectiveness</td>
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<tr>
<td>2. Human capital and research</td>
<td>71</td>
<td>103</td>
<td>Tertiary enrolment</td>
<td>Expenditure on education</td>
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<td></td>
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<td>Tertiary inbound mobility (foreign students)</td>
<td>Graduates in science &amp; engineering</td>
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<td></td>
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<td></td>
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<td>Gross expenditure on R&amp;D</td>
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<td>3. Infrastructure</td>
<td>97</td>
<td>91</td>
<td>ICT access</td>
<td>Logistics performance</td>
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<td></td>
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<td>GDP/unit of energy</td>
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<td>Environmental certification</td>
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<tr>
<td>4. Market sophistication</td>
<td>48</td>
<td>46</td>
<td>Ease of access to credit</td>
<td>Domestic credit to private sector</td>
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<tr>
<td>5. Business sophistication</td>
<td>84</td>
<td>85</td>
<td>Knowledge intensive employment (% total employment)</td>
<td>% Firms offering formal training</td>
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<td></td>
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<td>University-industry collaboration</td>
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<td></td>
<td></td>
<td>Cluster collaboration</td>
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<tr>
<td>6. Knowledge &amp; technology outputs</td>
<td>58</td>
<td>50</td>
<td>Relative rates of patents and scientific publications</td>
<td>High &amp; medium tech manufacturing</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>ICT service exports</td>
<td>ISO 9001 quality certification</td>
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<tr>
<td>7. Creative outputs</td>
<td>53</td>
<td>44</td>
<td>Creative goods &amp; services</td>
<td>Creative goods exports</td>
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<td></td>
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<td>Online creativity</td>
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## Armenia’s innovation system: selected key metrics

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Armenia</th>
<th>Benchmark</th>
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<tbody>
<tr>
<td>Professional, scientific &amp; technical sector, % GDP)</td>
<td>1.3%</td>
<td>10% in the EU28</td>
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<tr>
<td>Innovation active enterprises %</td>
<td>9.4%</td>
<td>Estonia 26.5%</td>
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<tr>
<td>Export orientation</td>
<td>6.05%</td>
<td>Central Europe &amp; the Baltics 10.8%</td>
</tr>
<tr>
<td>Financial instruments to support business investment in R&amp;D &amp; I</td>
<td>n.a.</td>
<td>BERD financed by Gov. PPS$ per capita. Estonia 9.3 Ireland 19.3</td>
</tr>
<tr>
<td>University-industry collaboration in R&amp;D</td>
<td>88th out of 137 countries</td>
<td>GCR 2017-18</td>
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<tr>
<td>Availability of latest technologies</td>
<td>77th out of 137 countries</td>
<td>GCR 2017-18</td>
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<tr>
<td>STEM graduates</td>
<td>90th / of 102 countries</td>
<td>GII 2017</td>
</tr>
<tr>
<td>Researchers in R&amp;D per million population</td>
<td>1,499 (2014)</td>
<td>Estonia 3,284, Lithuania 2,961 Russian 3,102</td>
</tr>
<tr>
<td>Firms offering formal training % firms</td>
<td>84th out of 92 countries</td>
<td>GII 2017</td>
</tr>
<tr>
<td>Innovation partnerships/clusters</td>
<td>89th / 123 countries</td>
<td>GII 2017</td>
</tr>
<tr>
<td>Gross R&amp;D expenditure per capita (2014) (PPS)</td>
<td>17.64</td>
<td>Central &amp; Eastern Europe 153.24 &lt;-&gt; Georgia 23.91</td>
</tr>
<tr>
<td>Scientific specialisation</td>
<td>13th all subjects / 7th Physics and astronomy</td>
<td>Eastern European countries (SCIMAGO)</td>
</tr>
<tr>
<td>Technological specialisation</td>
<td>Mechanical eng. 35% total / chemistry 19.3% / electrical eng. 15.8%</td>
<td>Based on national patent classes</td>
</tr>
<tr>
<td>GERD per researcher (2014 (PPS)</td>
<td>Estimated 13.53</td>
<td>Central &amp; Eastern Europe 74.01 &lt;-&gt; Georgia 12.56</td>
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The innovation support toolset is limited and largely depend on donor financing

### Toolset

<table>
<thead>
<tr>
<th>Startups</th>
<th>Operating companies</th>
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<tbody>
<tr>
<td>• Idea grants</td>
<td>• VAT and customs duty incentives for import of production technologies</td>
</tr>
<tr>
<td>• Technology training and skills development delivered by technology centers (MIC, EIF, GTC, VTC etc)</td>
<td>• Debt financing with privileged interest rates for introduction of energy efficient technologies</td>
</tr>
<tr>
<td>• Seed funding guarantees (SMEDNC)</td>
<td>• Export support (DFA)</td>
</tr>
<tr>
<td>• Income tax incentives for IT start ups</td>
<td>• Grants for collaborative R&amp;D from SCS (co-financing from business is precondition)</td>
</tr>
<tr>
<td>• Idea and innovation matching (EU)</td>
<td>• Subsidize introduction of agriculture machinery and technology (MA)</td>
</tr>
<tr>
<td>• Incubation and acceleration services (available in Yerevan and two large cities)</td>
<td>• Credit guaranty scheme</td>
</tr>
<tr>
<td>• Technology consulting in the frame of donor funded projects delivered through external consultants (e.g. PUM, Farmer to Farmer)</td>
<td>• Idea and innovation matching grants (EU)</td>
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### Sectoral focus

<table>
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<tr>
<th>Startups</th>
<th>Operating companies</th>
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<tbody>
<tr>
<td>• IT, engineering and some high tech fields</td>
<td>• Risk capital financing is largely focused IT, engineering and some high tech fields</td>
</tr>
<tr>
<td>• SME DNC “Successful start” program with focus on rural businesses (minor focus on innovation)</td>
<td>• Almost all other sectors are eligible for rest of tool set</td>
</tr>
</tbody>
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Towards SMART Armenia
Armenia’s innovation system is not a basis to enhance long-term competitiveness

- Share of **knowledge intensive sectors** in economy is less than half that of advanced countries
- Less than 10% of firms are **innovation active**, although varies by sector.
- **Export orientation** to less demanding (technological, quality, etc.) markets
- **Weak FDI** limits potential for tech. & managerial upgrading

- **No financial instruments** to support business investment in innovation or R&D
- **Absence of key functions**, within existing agencies, required to develop in-house capacities of business to innovate
- Few organisations providing **specialised services** (innovation management, technology advice, IP, standards, etc.)

- **Insufficient STEM graduates**
- **Relatively low number of researchers** in Armenian science system
- **Gaps in managerial, technical and vocational skills** required for innovation activity in business sector.
- Limited experience in developing **innovation partnerships** (clusters, etc.)

- **R&D expenditure** stable at low level in last decade (missing data on business R&D)
- Aside from physics, **weak international scientific specialisation**.
- **Limited technological specialisation** in electrical & mechanical engineering & chemistry
- Scientific funding is spread over a large number of **sub-critical scale institutions**
High-level commitment, inherited research capabilities and successful initiatives are solid bases for boosting innovation

Existing assets

• **High recognition of innovation** on policy level (Government programme, ADS 2030)

• **Internationally competitive research capabilities** in selected fields and relatively strong scientific output results

• **Success in building dynamically developing and internationally linked innovation ecosystem** in ICT and, to some extent, engineering service sectors

• **Networked and experienced diaspora** in science and technology (S&T) and business sectors

• **Large-scale educational initiatives** and positive attitude towards education

• Some examples of **innovation support infrastructure and services** (funded by government, donor and diaspora)

Examples of key factors

Science and education

• Good performance in physics & astronomy by H-index
• Upgrade of educational capabilities ANEL, MIC, TUMO
• New EU project with TUMO on boosting educational base in STEM
• FAST Foundation

Business

• IT and engineering service clusters with 600 mln USD turnover
• Presence of several MNCs
• Internationalized local companies (Picsart, Sololearn...)
• Emerging capabilities in the field of disruptive technologies (AI, Big Data, Robotics and drones etc)
• Expanding business development infrastructure: EIF, GTC, VTC, FEZs
To utilize Armenia’s capacities effective and efficient a shift in overall innovation support approach as well as its governance is needed.

Current set-up of innovation ecosystem

- Low level of investment in research & innovation do not match aspiration to develop a ‘smart’ economy.
- Weak innovation activity in business which lacks managerial and technical capacities to support technological upgrading.
- Incomplete support portfolio with mainly general instruments distributed in different implementation agencies
- No clear strategy and midterm roadmap
- No coordination between science, education and economic policies and activities
- Not coordinated donor activities with case by case intervention

Suggest change in set-up of innovation ecosystem

- Shift to a programme approach through structuring of innovation support services with clear strategic focus
- Systematic sectorial approaches to foster efficient use of joint infrastructure and develop learning industries
  - Focus on raising of absorption capacity and innovative upgrade of companies
  - Increase quantity and quality of human capital in the addressed sectors
- Establishment of coordinated action between science, education and economic policy and instruments, donor activities aligned
The strategy proposes three pathways to shift Armenia towards a knowledge economy and foster innovation-led growth opportunities.

### PATHWAYS

**Technology-niche leadership**
- Use innovation as driver
- 3-5 tech clusters with ECEI cluster excellence silver label (baseline none)
- 2000 graduates in priority advanced technologies (baseline n.a.)
- Share of high-tech manufacturing and knowledge-intensive services doubles

**Innovation for export growth**
- Drive Technology Specialisation
- Cluster sector development (3-5 cluster)
- 50% share of business sector in R&D expenditures (baseline n.a.)
- Share of medium/high tech in manuf. exports grows to 40% (baseline 10%, 2016)

**Challenge Driven Innovation**
- Focused Catch-up
- Armenia Innovates Campaign
- Raising absorption capacities
- Improved performance on resource efficiency, income inequality (baseline n.a.)
- Armenia in top 30 in world for government effectiveness (baseline 79th, 2017).
- Environmental, health and social sectors value added increases

### COMPONENTS

- Select 3-5 science & technology fields and concentrate efforts
- Develop critical mass of specialized experts & capacities
- Pooling activities in joint innovation competence centres
- International outreach & market access support
- Cluster sector development (3-5 cluster)
- Raising absorption capacities
- Product & process upgrade
- Innovation challenge partnerships
- Innovation in society challenge prize
- Public sector innovation lab

### QUANTIFIABLE OUTCOMES (2030)

- Number of innovative active companies triples to 30% (baseline <10%, 2017)
- Share of medium/high tech in manuf. exports grows to 40% (baseline 10%, 2016)
By applying innovation Armenia can overcome three main challenges and become a more prosperous economy in 2030.

**MAIN CHALLENGES**

**Weak technology progress & knowledge generation**
- Weak science & technology specialisation and under-investment
- Science & education system contributes rarely to development

**Low Competitiveness & Business Innovation**
- Low level of company innovation activities and ability for absorption
- Limited competitiveness in regional and international markets

**Limited Innovation in and for society**
- Needs for cost-effective and innovative solutions to ‘societal challenges’
- Low understanding & usage of innovation as driver for well-being is limited in society

**MAIN APPROCHES**

**Drive Technology Specialisation**
- Concentrate efforts to achieve leadership in distinct technology niche

**Focused Catch-up**
- Foster managerial and technological upgrade for high value export sectors

**Use innovation as driver**
- Develop innovation partnerships to solve societal challenges and use this as a driver to change perception of innovation

**MAIN IMPACT (2030)**

- Armenia is internationally recognized as a provider of advanced technology solutions
- Knowledge-intensive employment and share of value add in economy doubles

- Value of manufacturing exports per capita triples and share of medium-high manufacturing exports increases to 40%
- Growth in productivity to reach average level of Central and Eastern European countries

- Armenia is attractive to leading tech firms and partnerships as a place to test and demonstrate innovative solutions.
- Public sector systematically adopts innovative methods to leverage maximum return from government expenditure.
- Transform society to become more innovative
Building up 3-5 new high tech clusters with focused public investment in education and R&D followed by intensive internationalisation support.

Select 3-5 science & technology fields and concentrate efforts
- Multi-stakeholder Smart Specialisation process
- Alignment and concentration of science & higher education strategy and budgeting

Pooling activities in collaborative applied competence centres
- Establishment of science – education – business cluster
- Facilitation of joint R&D work and education programs
- Manage collaborative use of research infrastructure

Develop critical mass of specialized experts & capacities
- Upgrade/develop academic programmes (B.A & M.A.)
- Development doctoral schools
- Upgrade of need R&D infrastructure, Prototyping & FabLab facilities
- Support to joint research

International outreach & market access support
- Focused Business advice
- International Acceleration Programmes
Improve the international competitiveness of the export oriented sectors by improving technology absorption and later innovation capacities of the companies.

Innovation for export growth

Potential Innovators
- Selection of 3-5 export cluster
- Define sector upgrade agenda
- Coordinating sector skills development
- Joint utilization of infrastructure and services
- Support joint international market and GVCs access
- Attracting MNC investment

Innovating Leaders

Cluster sector development

Non Exporters

Management systems
- Quality assurance
- Financial incentives to implement upgrade projects

Applied certification programmes at EIs.
- Specialized vocational training

Technological upgrade
- Innovation management
- Financial incentives for technological upgrade and product development projects

Product & process upgrade
- Innovation consultancy

Skills upgrade in Workforce
- Innovation audit

Raising absorption capacities

Large Companies / MNCs
- Attracting MNC investment
Applying the challenge driven innovation pathway Armenia can effectively solve societal challenges and utilizes this to become international lab for innovative technologies.

Armenia Innovates Campaign
- Media, training and capacity building targeting broad range of societal actors
- Annual innovation awards in business, public and social innovation, etc.

Innovation challenge partnerships
- Three stage competition providing funding for feasibility, piloting and scale up/international acceleration of innovation partnerships including foreign technology partners.

Innovation in society challenge prize
- 2030 deadline – international competition
- Challenge addressing Armenian SDG priorities

Public sector innovation lab
- Task-force: introduction of innovative processes & technologies in public sector
- Training and capacity building
- Piloting of innovative public procurement, etc.

Promotion of RA solutions

RA become international LAB

Societal challenges

Awareness & Culture
Effective Solving Challenges
Capacity for Transformation
Examples from best practice for 3 pathways

**Case**

**Ireland**: Centres for Science, Engineering & Technology (CSETs)
Science Foundation Ireland (2003-12)
Objectives: Improve linkages between scientists and engineers, foster new tech firms, attract FDI in tech fields

**Key interventions**

- 10 centres funded (ICT, bioscience, nanotech) by SFI = €225m over 10 years
- New research facilities & equipment
- Joint academic-industry research strategies
- Education (Masters, PhDs, staff exchange)
- Tech-transfer and commercialisation

**Key results**

- €77m of industry funding leveraged
- 57 industry partners – majority MNCs
- By 2011, 1341 staff employed by CSETs
- 287 industrial PhDs and 159 MSc generated by centres
- 32 patents granted and 72% of industry partners applying CSET results

**Basque Country** (Spain): Cluster policy developed in 3 phases since 1992.
Managed by SPRI (industrial development agency)
Objective: restructure main sectors & increase value added exports

**Key interventions**

- Cluster support programme: p.a. per cluster €2.5m for cluster development services and €0.5m for internationalisation
- Funding for joint R&D projects
- INNOBIDEAK programme for managerial and organizational innovation upgrading

**Key results**

- Currently 22 clusters of which 11 are national/world class (e.g. automotive, advanced machinery, energy)
- Growth in turnover, specialization and exports (e.g. automotive and metal manufacturing clusters, 2013-15)

**Scotland**: Wave & Tidal energy partnership
Scottish Enterprise/HIE 2010-2015
Objective: develop and capture the full value from natural resource (25% of EU capacity in Scottish Waters)

**Key interventions**

- European Marine Energy Centre (2003-) technology campus in Orkney
- Wave Energy Scotland: funding for firms (incl. MNC) to test technologies in Scottish waters
- Saltire Challenge Prize (launched in 2007) for 1st commercial generation from marine energy

**Key results**

- MeyGen tidal stream energy project in commercial phase – 120 jobs created.
- WES: 56 projects funded with 150 organisations from 11 countries
- More than €30m in EU R&D funding secured – notably via EMEC and MeyGEN.
To ensure the implementation of innovative approaches in different policy fields the following overarching principles should be applied.

• Inter-ministerial task force proposes an overall financial framework (taking account of public, private and donor spending) for 3 short term budget and long term indicative planning

• Policy initiatives of all ministries should include priority fields/sector/challenges as criteria for funding.

• Impact assessment on innovation made a pre-condition for new regulatory and legislative proposals from all ministries

• Guidance framework on optimising innovation and best available technologies when using procurement, public-private partnership investments, etc. (approved by Innovation Council)
To further elaborate and implement the strategy, the Government and MEDI should focus on the following initiatives in 2018.

1. Strategy consultations
2. I. Strategy conference (05/18)
3. SMART-specialisation (05-11/18)
4. Innovation council first meeting (10/2018)
5. II. Strategy conference (11/18)
6. Agreement/Funding (11/18)
7. Launch of pathways (01/2019)

- Strategy adaption consensus
- Gathering actors
- Donors coordination mechanism
- Selection of priority fields (3 pathways)
- Definition of Roadmaps and players
- Establishment of high-level steering structure
- Approval of priority fields & roadmaps
- Commitment of actors and resources
- Donor involvement matrix
- Investment and budget plan
- Appointment of coordinating structures
- Procurement of support services
- Call for cluster etc. management
The full package of innovation mapping & strategy was handed over to the RA Ministry of Economic Development and Investments.

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