PEER REVIEW OF THE UKRAINIAN RESEARCH & INNOVATION SYSTEM

PSF BACKGROUND REPORT UKRAINE

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General Remarks

- Ukraine is special and needs tailor-made suggestions and solutions
- Ukraine is a lower middle-income transformation country with a rich scientific heritage from the Soviet Union and with a good standard of education
- Unclear, if the economy transforms towards a knowledge based economy
- Ukraine is comparatively still quite industrialised; at the same time it remained an agrarian society in rural areas
- Ukraine is at war at Donbas region, confronted with an aggressive hostile superpower neighbour (e.g. annexation of Autonomous Republic of Crimea and Sevastopol)
- GDP fell by -15% in 2015 compared to 2014; GDP/capita is below 2008 level
- Political stability and effectiveness is limited (World Governance Indicators; Corruption Perception Index)
- S&T, however, was shrinking already as of independence
Data Quality

- Relatively scarcity / limited accessibility to data, STI policy reports and analysis in English
- Hardly any regional information
- **International statistics depict evident differences**
- No information about private non-profit R&D
- **Systematic business R&D beyond operations of industrial research institutes is hardly present or statistically insufficiently recorded**
- Strong differences in terms of R&D funding and R&D performance by BES
- **Ukraine does not implement the Community Innovation Survey (CIS)**
- Scarce data on venture financing
- **Bibliometric data** to be interpreted with care because of the relatively low inclusion of Ukraine in international English-speaking publication circles
- Data situation will improve due to **IUS/EIS inclusion of Ukraine**
Observations on Innovation Policy

1) Private R&D funding increases slowly, but is still very low (< 20%)
2) Business enterprise sector (BES) consumed 55% of GERD in 2013, but financed much less R&D
3) Industrial research institutes are performing business oriented R&D – they are a heritage from Soviet system
4) 16% of industrial enterprises engaged in R&D activities in 2014
5) BERD is concentrated on (traditional) machine-building occupying lower market segments which face fierce competition from emerging economies – Russia was the main customer for machine-building products of Ukraine
6) Ukraine’s high- and medium-tech sectors shrunk threefold since 1990s
7) Limited public support for innovation financing
Technological innovation Priorities

1) Energy and energy-efficiency
2) Transportation in a broad, but also peculiar fields (rocket and space; aircraft industries; ship-building; armament and military technologies)
3) New materials with emphasis on nano-materials
4) Agro-industrial technology-driven modernisation
5) Bio-medicine (medical services and treatment devices, pharmaceutics)
6) Cleaner production and environmental protection
7) ICT & robotics

• No indication about broader understanding of innovation (e.g. service innovation; business-model innovation; public sector innovation,; social innovation)
Technological readiness level is average

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<tr>
<td>Technological readiness level (overall)</td>
<td>81 / 3,6</td>
<td>94 / 3,3</td>
<td>85 / 3,5</td>
<td>86 / 3,4</td>
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<td>Availability of latest technologies</td>
<td>69 / 4,8</td>
<td>106 / 4,3</td>
<td>113 / 4,1</td>
<td>96 / 4,3</td>
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<td>Firm-level technology absorption</td>
<td>80 / 4,8</td>
<td>100 / 4,3</td>
<td>100 / 4,2</td>
<td>100 / 4,2</td>
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<td>FDI and technology transfer</td>
<td>109 / 4</td>
<td>131 / 3,6</td>
<td>127 / 3,7</td>
<td>117 / 3,8</td>
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<td>Individuals using Internet, %</td>
<td>88 / 30,6</td>
<td>93 / 33,7</td>
<td>82 / 41,8</td>
<td>80 / 43,4</td>
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<td>Fixed-broadband internet subscriptions per 100 inhabitants</td>
<td>69 / 7</td>
<td>71 / 8,1</td>
<td>68 / 8,8</td>
<td>72 / 8,4</td>
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source: WEF Global Competitiveness Reports 2012 to 2016; around 140 countries covered
Ease of doing business-ranking 2016

- Ukraine in “getting credit”: 19th of 189
- Ukraine in “starting a business”: 30th of 189
- Ukraine in “registering property”: 61st of 189
- Ukraine in “protecting minority investors”: 88th of 189
- Ukraine in “enforcing contracts”: 98th of 189
- Ukraine in “paying taxes”: 107th of 189
- Ukraine in “trading across borders”: 109th of 189
Recommendations of UNECE Review on Innovation

1) Regular evaluation of innovation system
2) Development of a holistic and concise national innovation strategy
3) Creation of National Innovation Council to improve system’s governance
4) Provision of financial resources
5) Link business promotion with innovation promotion
6) Foster industry-science linkages
7) Engage private sector in public technology programmes through consultations and PPPs
Observation concerning the S&T system (1)

1) Periodic changes in S&T governance
   - e.g. no State Funds for Basic Research
   - No State Agency for Science, Innovation and Informatisation
     but
     • National Council on Development of S&T
     • National Research Foundation
     • Recently amended law with focus on joint labs and start-ups

2) Post-Euromaidan governments (incl. MESU) show a strong readiness and efforts for system reform – HORIZON 2020 association should be regarded as element in this

3) Momentum of change – are we part of this?!
Observation concerning the S&T system (2)

1) 180 of around 1000 research and Higher Education institutions in Ukraine are directly subordinated to MESU

2) Other important players are
   – Ministry of Economy and Trade
   – Ministry of Finance
   – National Academy of Sciences of Ukraine (NASU)
   – Several other line ministries have R&D responsibilities
   BUT LACK OF COORDINATION

3) Regions seem to have a limited role
   LACK OF COORDINATION BETWEEN NATIONAL AND REGIONAL GOVERNANCE

WE NEED TO TALK WITH MANY STAKEHOLDERS!
Observation concerning the S&T system (3)

In 2016 MESU wants to use state budget increases to R&D for

- Basic funding of R&D institutions
- Grants for nationally funded projects
- Research infrastructure
- Support schemes for young researchers (incl. diaspora return)
- Evaluation of state research institutions and universities
- Access to R&D databases (Scopus, WoS)
- Establishment of National Research Foundation of Ukraine
Observation concerning the S&T system (4)

1) Theory and practice of policy formulation and policy-delivery including follow-up are two different things – this also concerns R&D funding

2) Broad definition of R&D priorities correspond to the broad R&D landscape (at least on paper)

3) State-support is for state-owned/influenced institutions

4) Competitive project-based funding is very low

5) Most of state R&D budget goes to NASU – NASU’s structure is currently under revision!

6) International R&D funding is high but dropped because of crisis (~ 20%)

7) Limited cooperation between public research institutes and HES

8) Low science-industry cooperation
Research Quality

- Research infrastructure facilities are overall outdated
- Low share and negative trend of Ukraine’s most cited publications worldwide as % of total scientific publications of Ukraine
- Very low level of public-private publications by million population
- Rather low but steadily increasing level in international scientific co-publications per million population
- Low share of international co-publications in Ukraine (33.46%)
- Ukraine is considered specialised in physics and astronomy, material sciences and chemistry, engineering, mathematics and earth and planetary sciences
- Specialisation improves over time in mathematics, earth and planetary sciences, energy and economics, econometrics and finance
Research Quality – Growth rate of (co-)publications
International co-publication partners

20 most involved countries in Ukraine's international co-publications and their average citations 2003-2013

- Number of co-publications with Ukraine
- Average citations

Countries included:
- Germany
- Russia
- USA
- Poland
- France
- Great Britain
- Italy
- Spain
- Japan
- Switzerland
- South Korea
- Czech Republic
- Austria
- Sweden
- Netherlands
- Belgium
- Mexico
- China
- Finland
- Canada
Higher Education System (HES)

- ~350 universities, but only half perform any kind of R&D
- Not all universities are subordinated to MESU (sometimes quality problems)
- Since 2005, Ukraine is member of the EHEA / Bologna Process
- New HE law introduces autonomy of universities
- Only a few are real seriously engaged in R&D (HERD was less than 7% of GERD in 2011)
- 70% of HERD comes from state and regional budgets
- HES is mainly absorbing scientifically educated personnel (70%); but mainly for teaching - 2.5m students enrolled
Human Resources

- Ukraine inherited a relatively well-developed education system
- Ukraine has a **high public spending on education** (incl. tertiary education), but (vocational) schools are lacking technical equipment
- Teaching approaches are old-fashioned
- Several incidents of **corruption in the education system at all levels**
- **Very high university enrolment** (80% of 19-25 year-olds), but low **PhD enrolment** indicating low interest to pursue scientific careers
- Also **high level of tertiary education attainment**, but **absorption capacity of the Ukrainian economy is limited**
- Ukraine belongs to the countries with highest share of over-qualification
- Students shift from natural sciences and technical sciences towards humanities, social sciences, business and law
Doctoral training and labour market for research

- Of the growing number of scientifically trained personnel only 20% are involved in R&D as primary job task
- Doctoral training lacks behind transformation of other level of higher educ.
- New positions are few and number of researchers is constantly declining (around the level of Austria)
- Large number of scientists are at pensionable age in Ukraine
- Researchers in BES / million inhabitants is low
Internationalisation

- Association to HORIZON 2020 on 20 March 2015
- Relatively good participation in FP7 (€30.9m) with good success rate (~ 20%)
- Participation in HORIZON 2020 did not improve (success rate of ~13%)
- Highest success rates in EURATOM; lowest in ‘industrial leadership’
- 25 intergovernmental S&T agreements with EU MS and AC (2014)
- NASU has 110 bilateral agreements (most projects with Poland, France, Hungary, Slovak Republic and Czech Republic)
- Nationally filed patents abroad are mostly in Russia, and with distance in USA, South Korea and Poland
- Few patents are recognised in EU and USA indicating a weak integration of Ukrainian companies in global value chains