Higher School of Economics

Institute for Statistical Studies and Economics of Knowledge

Foresight Centre

Long-term Prospects of S&T Development in Russia

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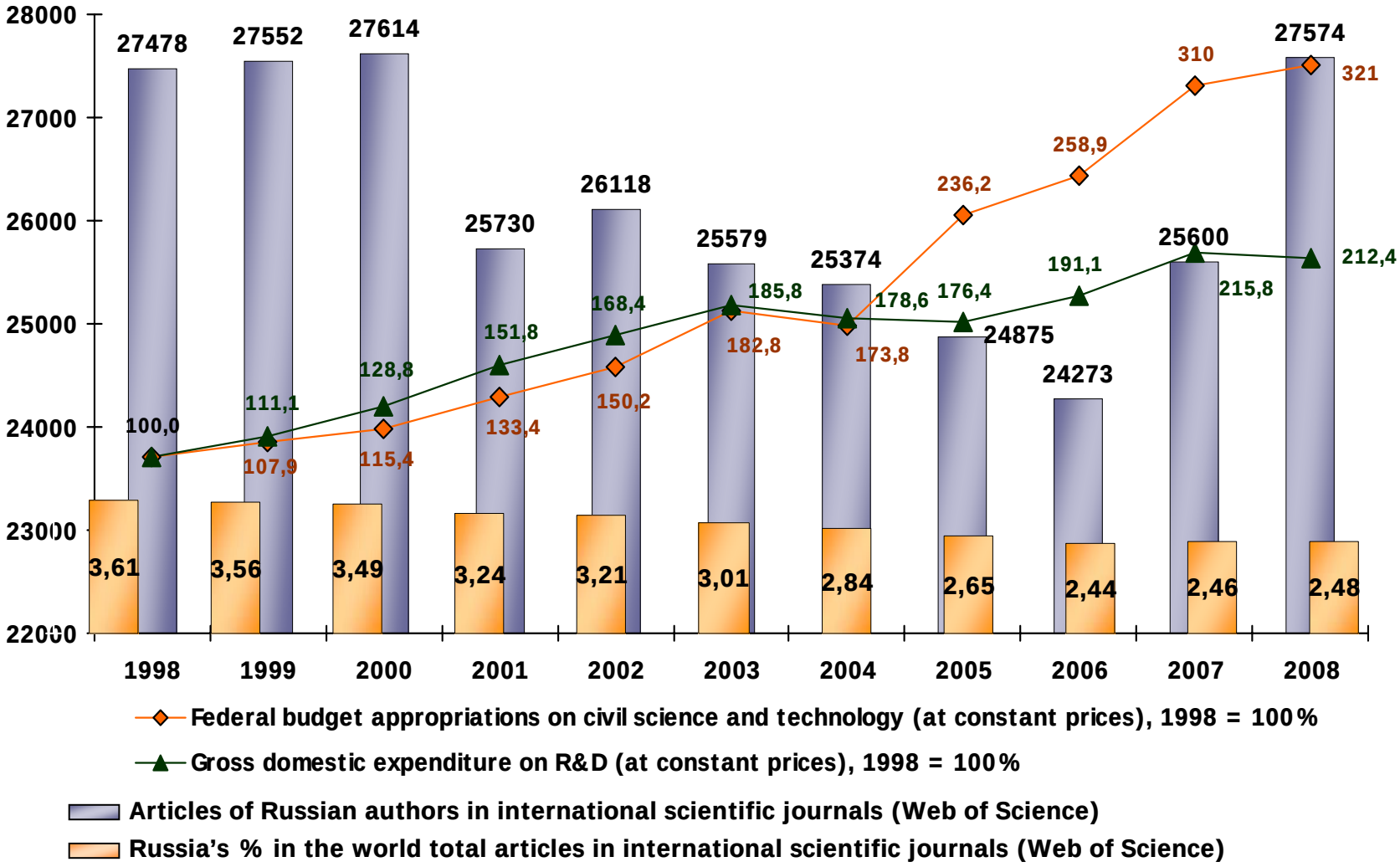
- S&T Foresight 2030 - major findings
- Follow-up activities
- Conclusions

R&D Performance vs. R&D Expenditure: Loss of Competitive Positions



Effects of the crisis (2008)

	Growth rate, %
Gross domestic expenditure on R&D, constant prices	**- 1.6**
Budgetary appropriations on R&D, constant prices	**3.5**
R&D-performing organisations	**- 7.4**
R&D-performing personnel	**- 5.0**
Sales of innovative products (goods and services), constant prices	**- 4.1**

Set of new Policy Instruments in Russia

- Priorities for technology modernisation
- Technology Platforms
- Innovation Programmes for State-owned companies
- Research universities + innovation infrastructure
- Linking enterprises and universities
- National research centres (Kurchatov institute)
- S&T Priorities and Foresight

Priorities for S&T and innovation

- Mission-oriented: Technology modernisation
- Functional: Restructuring S&T system
- Thematic: Critical technologies, S&T programmes

President's priorities for modernisation and technological development

- Energy efficiency
- Nuclear technologies
- Space technologies (e.g. telecom and navigation)
- Medicine
- Strategic information technologies

S&T Priorities (2010)

1. Information and telecommunication systems.
2. Living systems
3. Industry of nanosystems
4. Transportation and aerospace systems
5. Rational use of nature
6. Energy efficiency and energy saving

Critical technologies: 2010

ICT

Access to wide-band multimedia services

Information, management and navigation systems

Software for distributed high-performance computer systems

Development of electronic components

Living systems

Biomedical and veterinary technologies

Biological, biosysnthetic and biosensor technologies

Genome, proteomic and post-genome technologies

Cell technologies

Bioengineering

Decreasing losses from socially important diseases

Nanoindustry

Computer-aided modeling of nanomaterials, nanodevicecs and nanotechnologies

Nano-, bio-, info-, cogno- technologies.

Diagnostics of nanomaterials and nanodevices

Nanodevices

Construction nanomaterials

Functional nanomaterials

Transportation and aerospace systems

Provision of global safety and security of Russia on the basis of integrated transport and information space

High-speed transport facilities and intellectual control systems for new types of transport

Energy-efficient and environmentally clean transport

Rational use of nature

Prevention and liquidation of environmental pollution, monitoring and forecasting of the environment conditions

Prevention and liquidation of emergencies related to natural and technogene emergencies

Search, exploration, extraction and processing of natural resources

Energy efficiency and energy saving

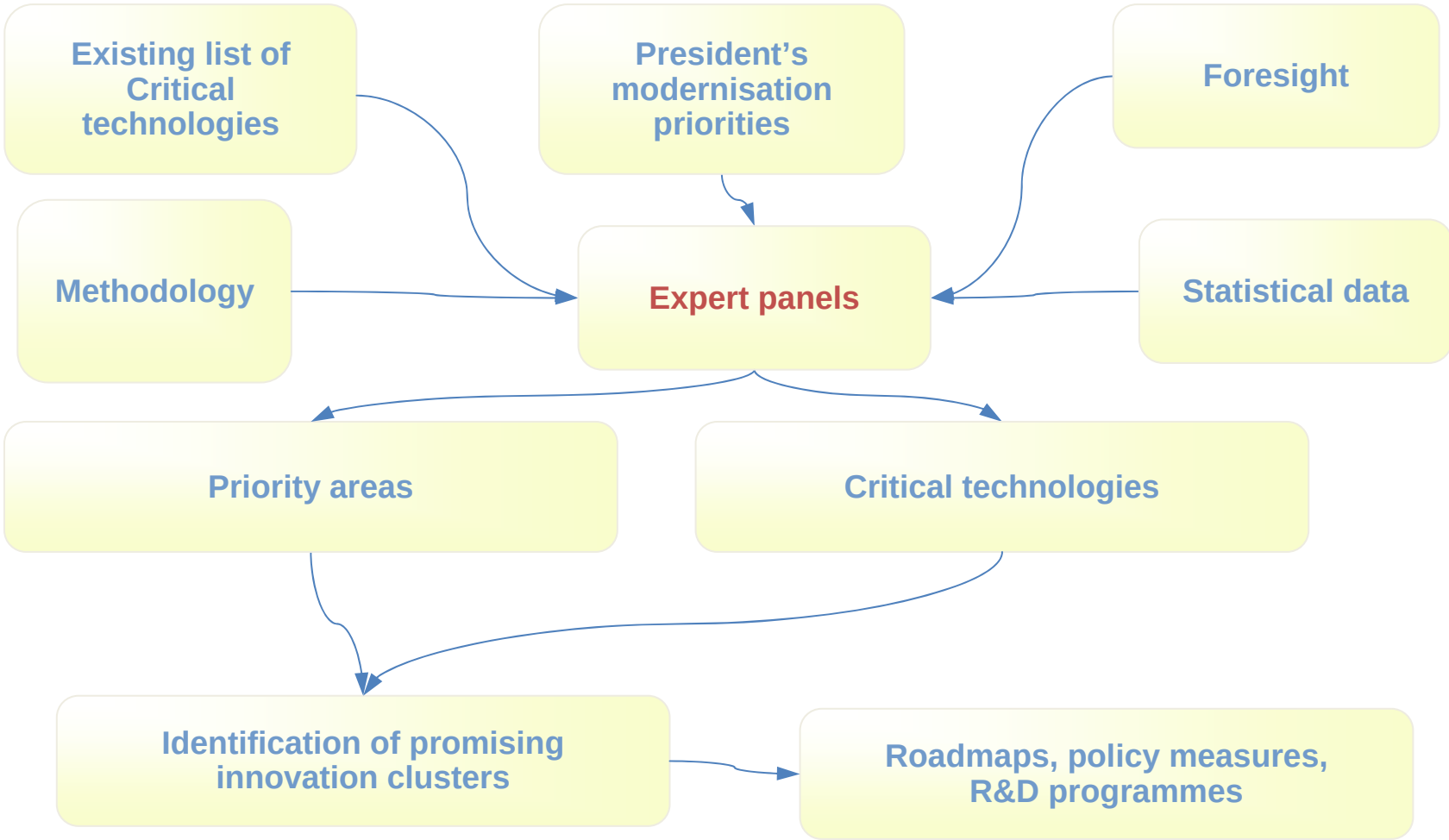
Nuclear energy, nuclear fuel cycle, safe treatment of radioactive waste and worked out nuclear fuel

New and renewable sources of energy including hydrogen energy

Energy saving systems for transportation, distribution and utilization of energy

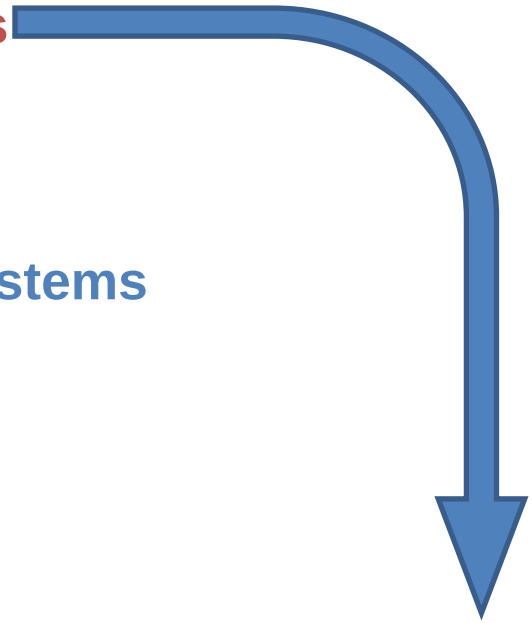
Energy-efficient generation and transformation of energy from organic fuel

Foresight and critical technologies: major activities



S&T Delphi: areas covered

Information and Telecommunication Systems
Industry of Nanosystems and Materials
Living Systems
Medicine and Health
Rational Use of Natural Resources
Transportation, Aviation and Space Systems
Power Engineering and Energy Saving
Manufacturing Systems
Safety and Security
Technologies for Society

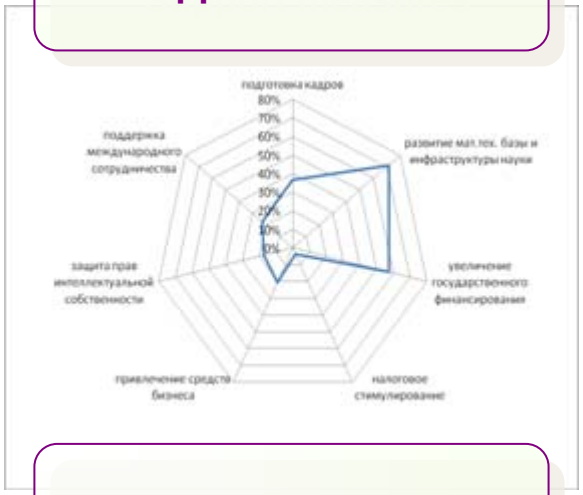


- nuclear technologies
- hydrogen energy
- organic fuel and microsystems
- composites and ceramic materials
- membranes and catalysts
- biocompatible materials

Delphi 2025: assessment of technology prospects

Level of R&D

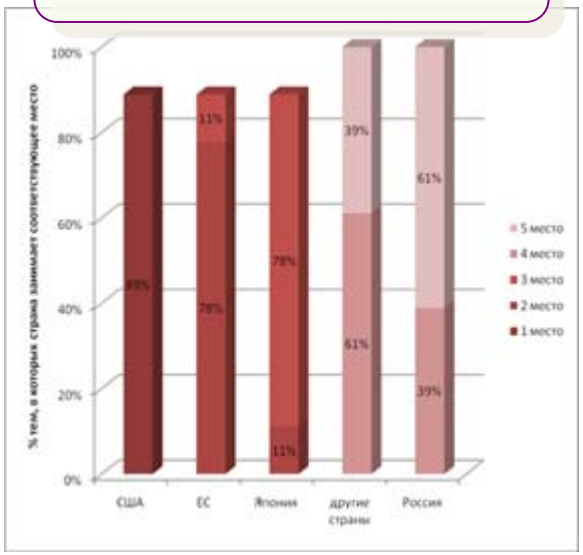
Support measures



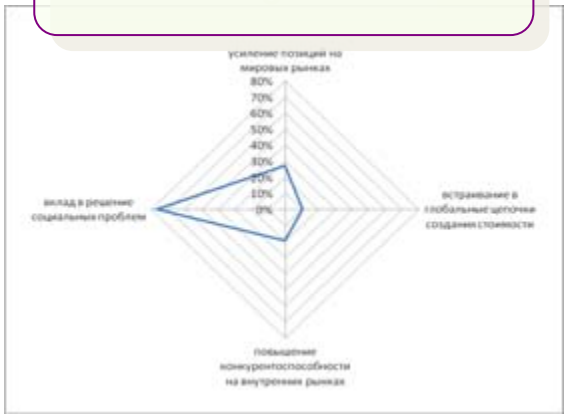
The most important topics

Time of realisation

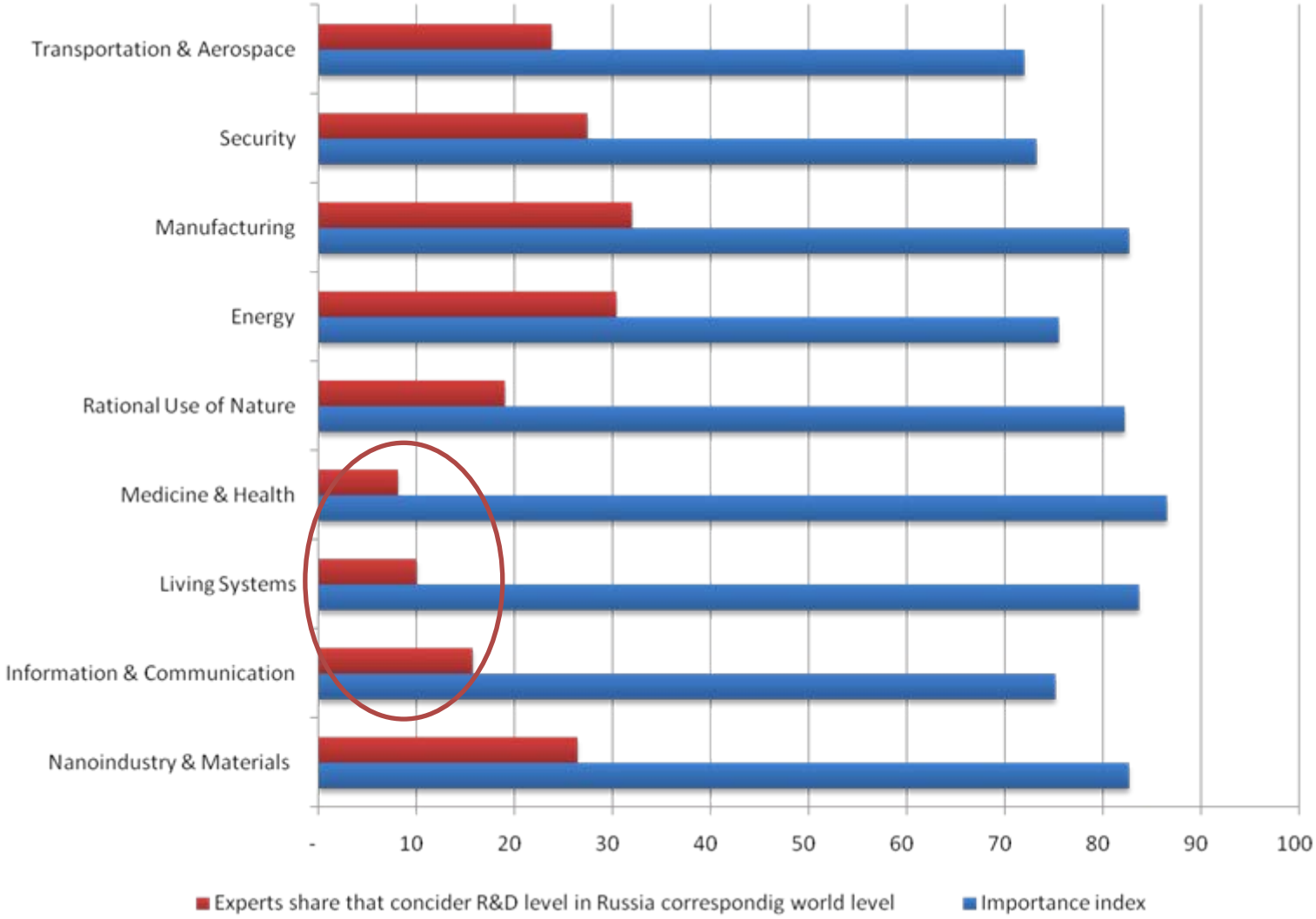
Leading country



Envisaged results

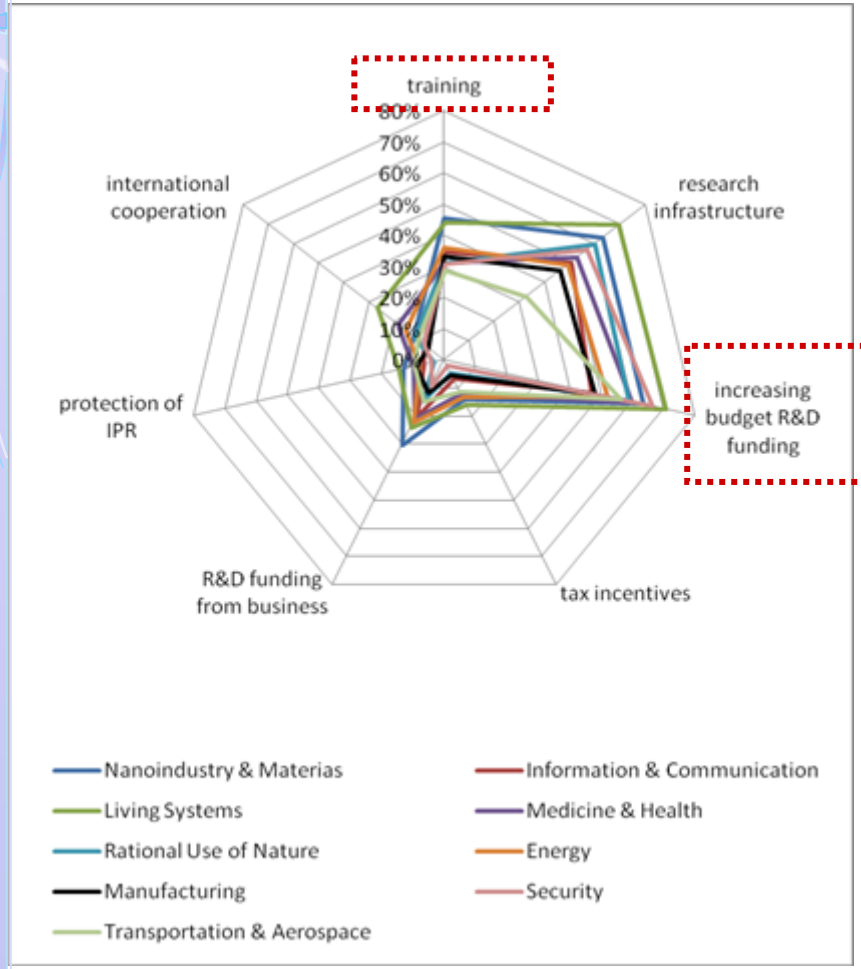


R&D level vs importance of S&T areas

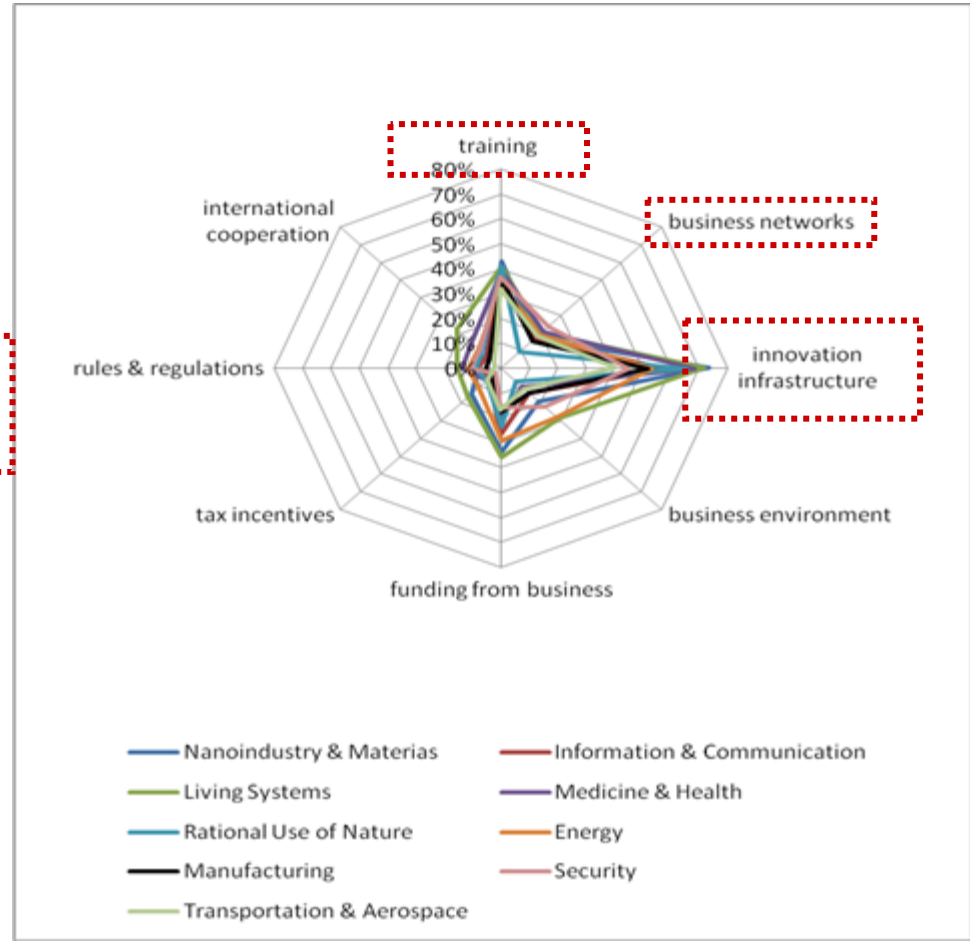


Support measures

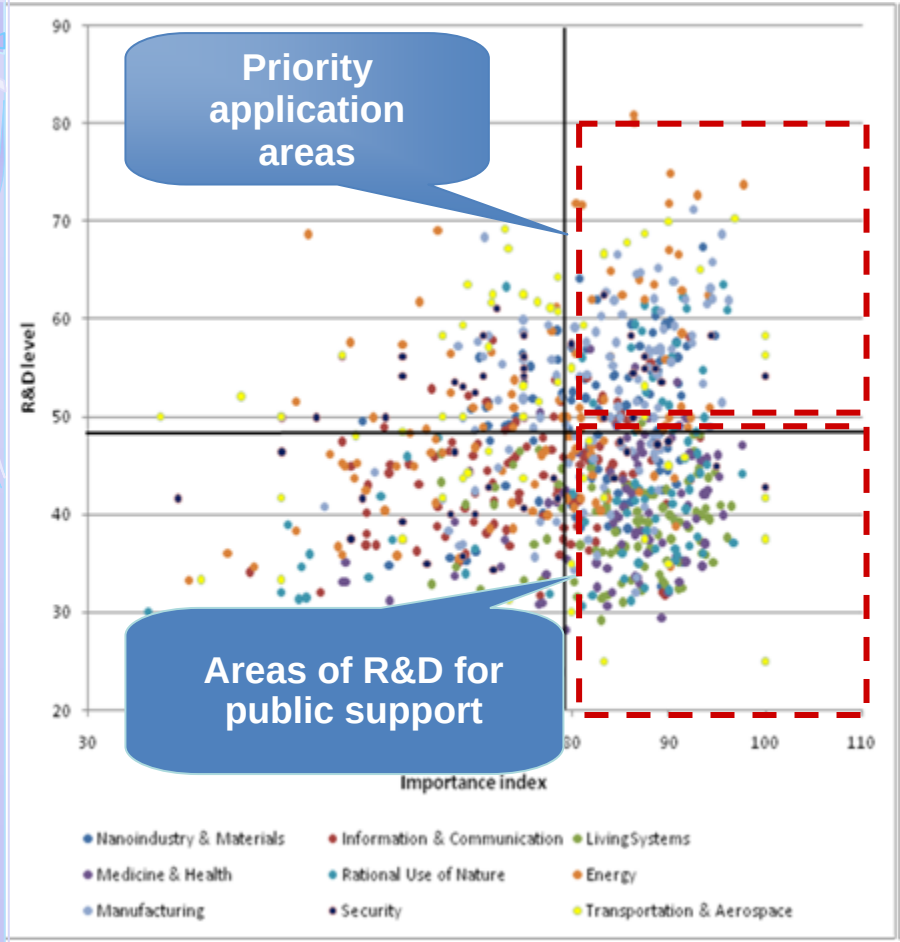
R&D

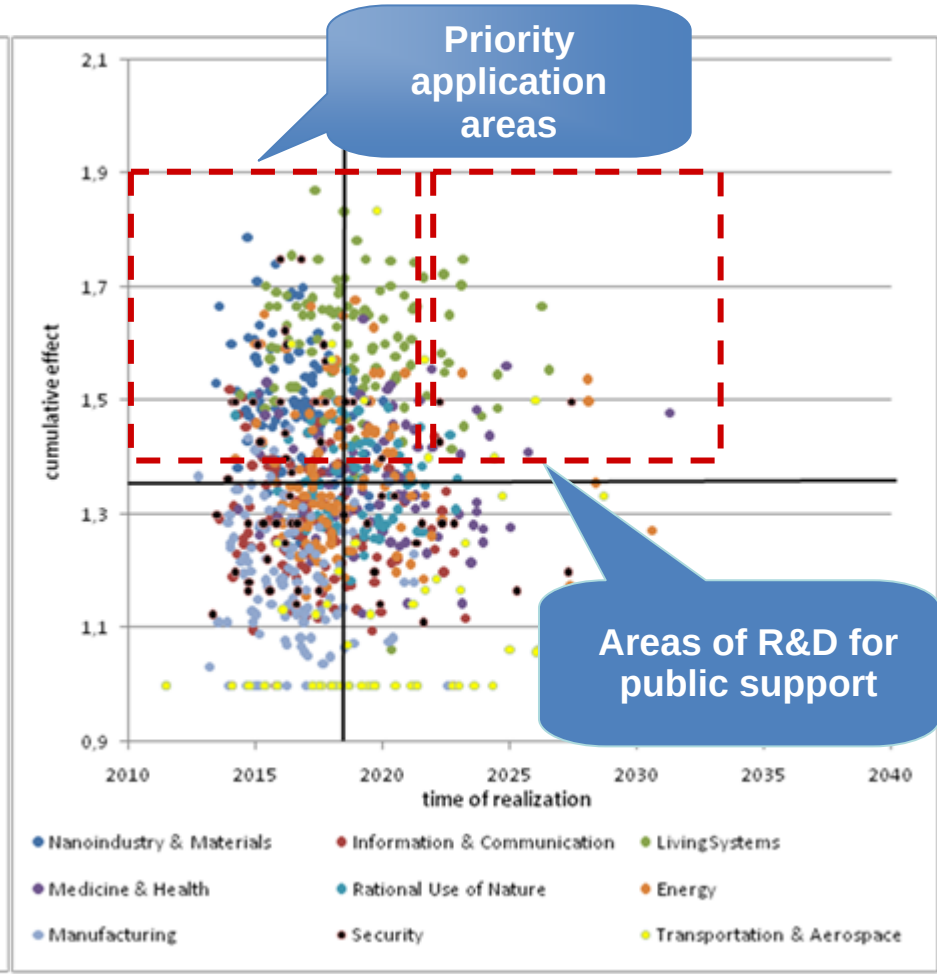


Commercialisation



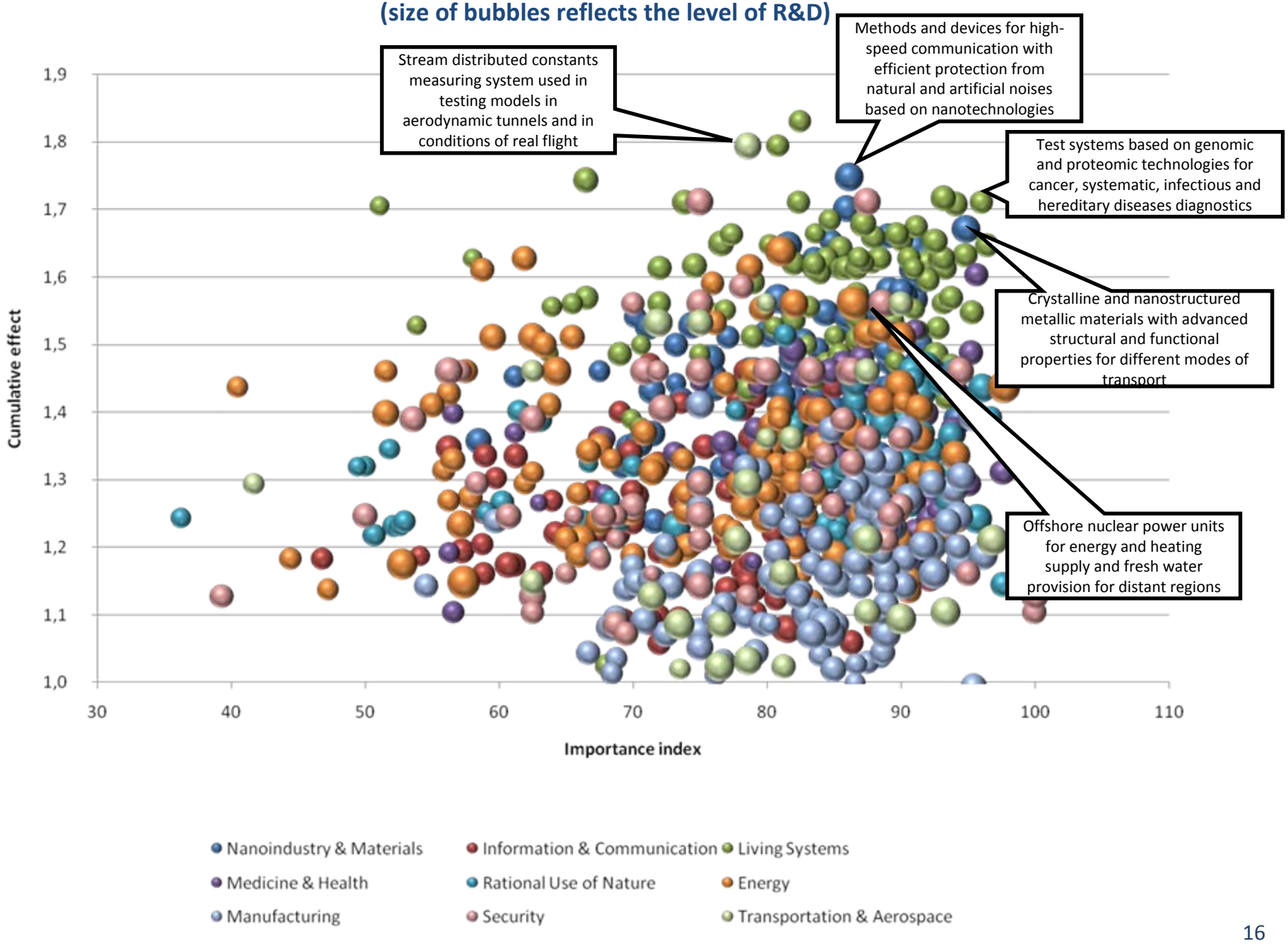
Selection of priorities
on the basis of the Delphi survey



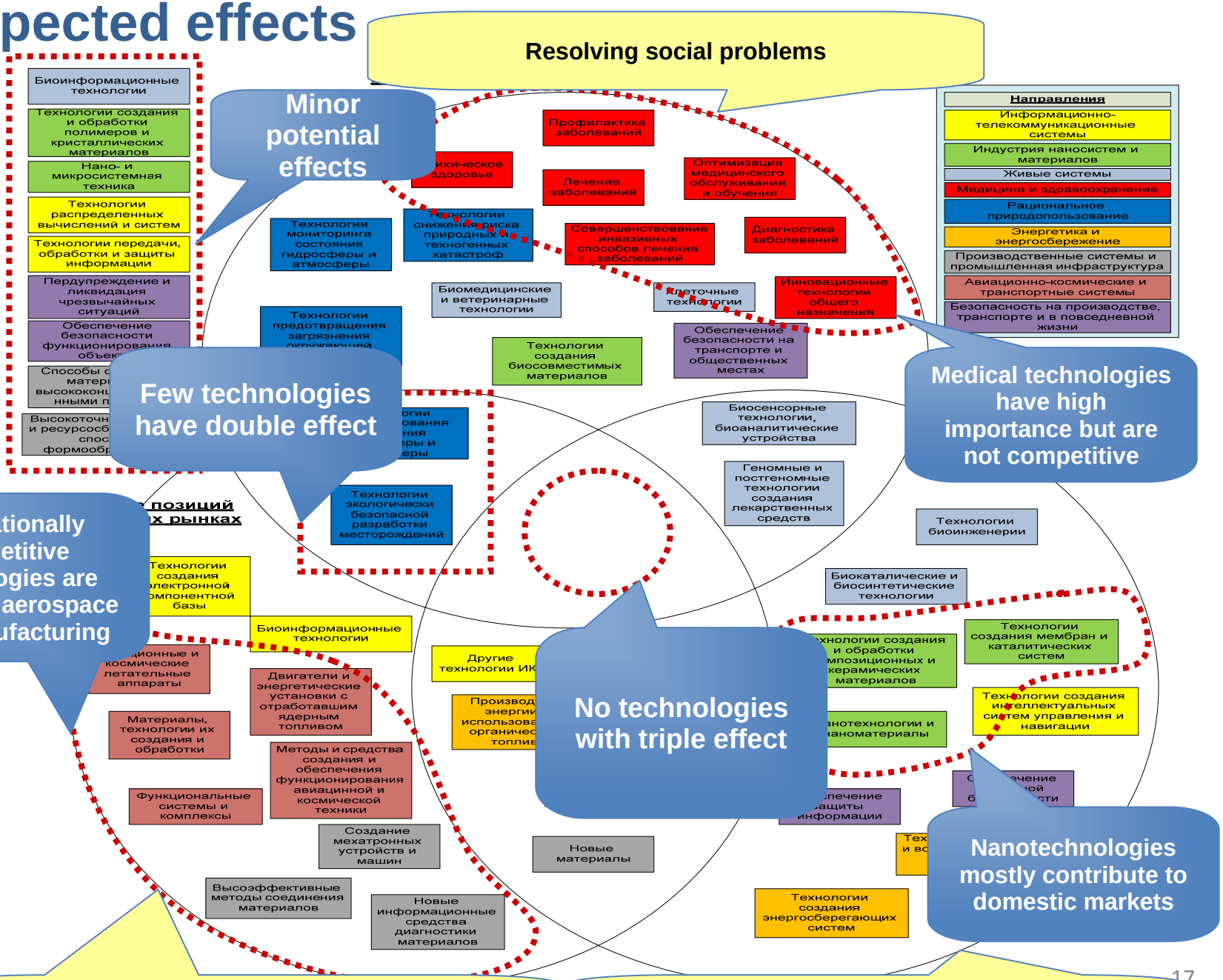


Themes' importance, R&D level and cumulative effect

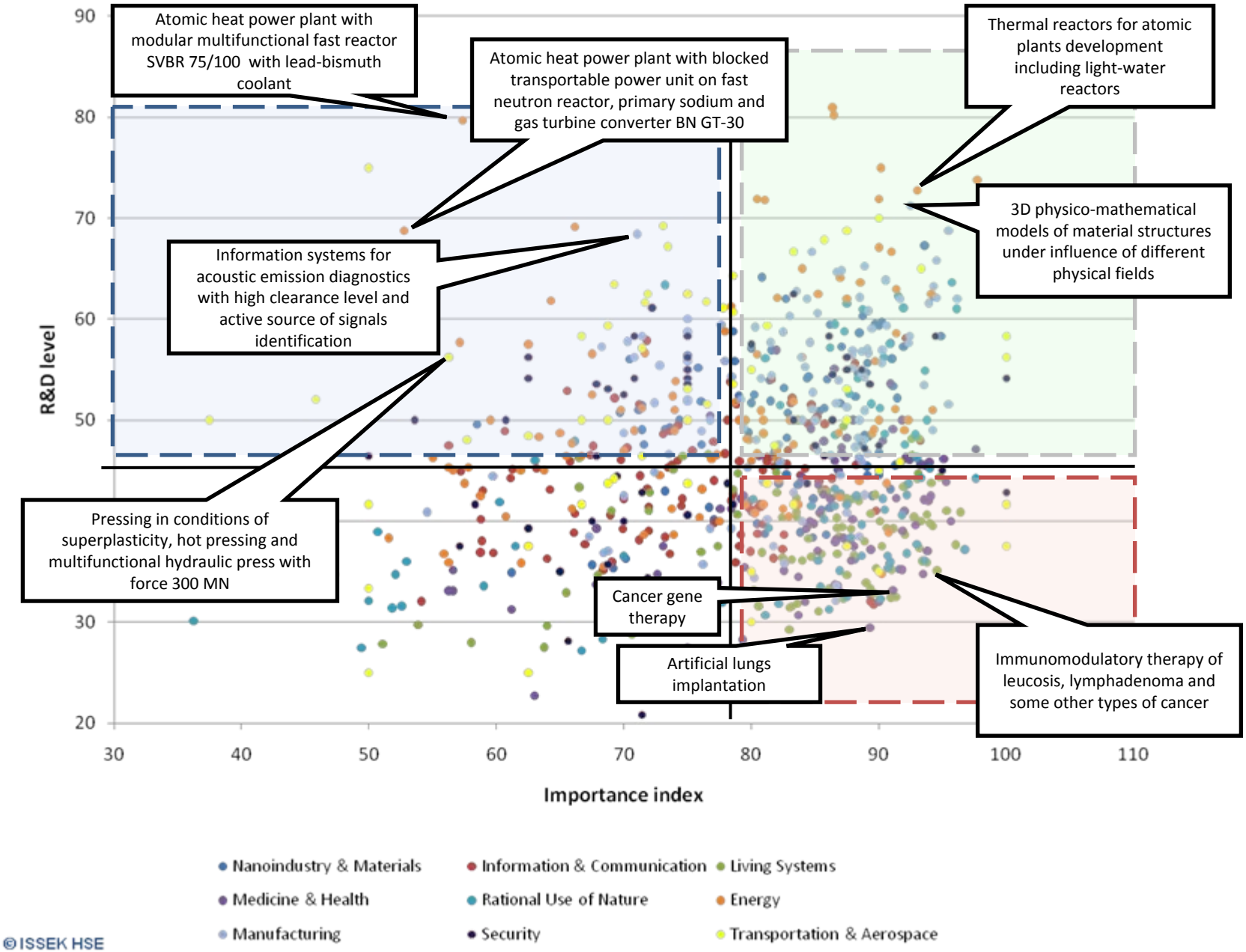
(size of bubbles reflects the level of R&D)



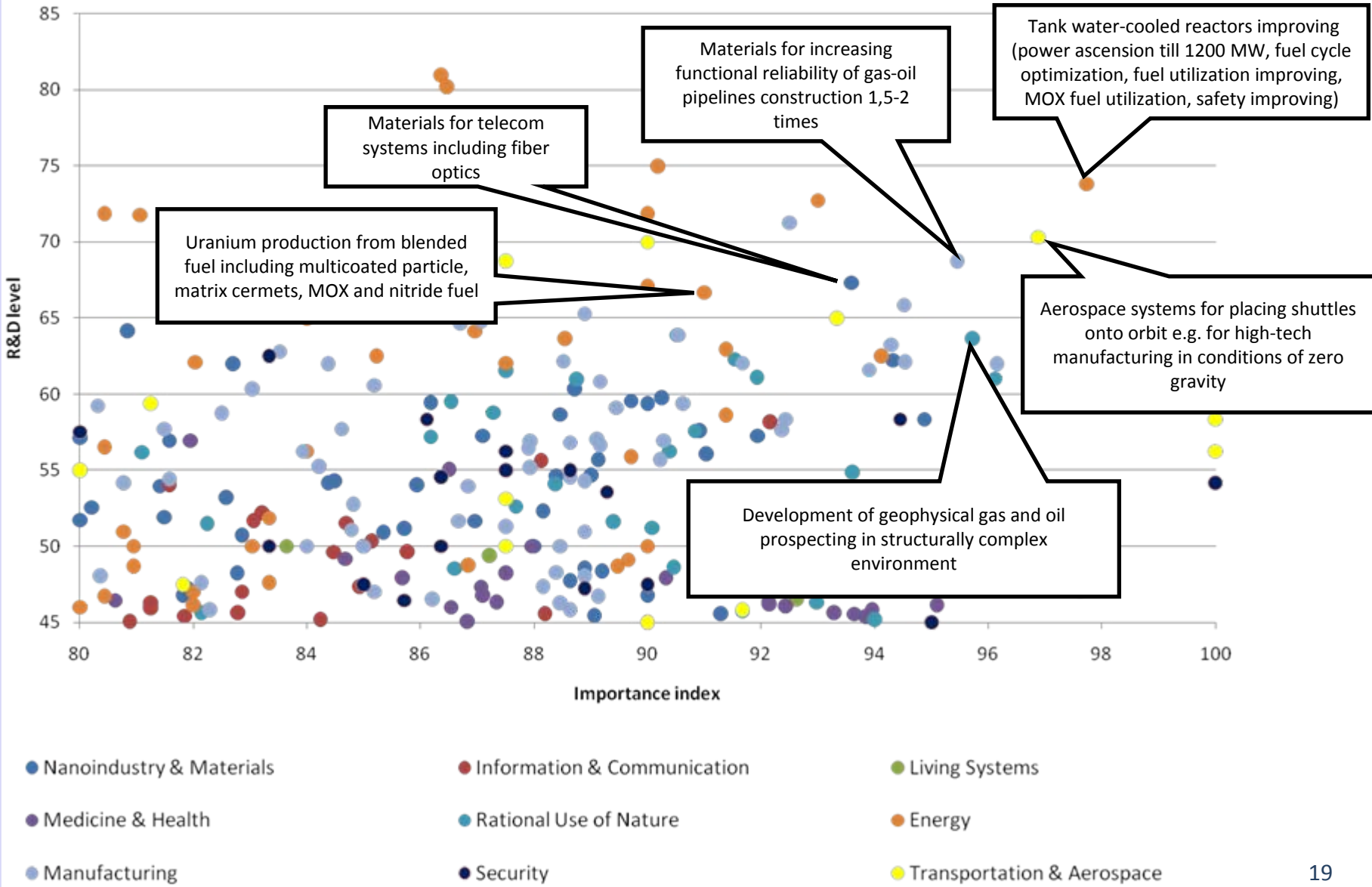
Expected effects



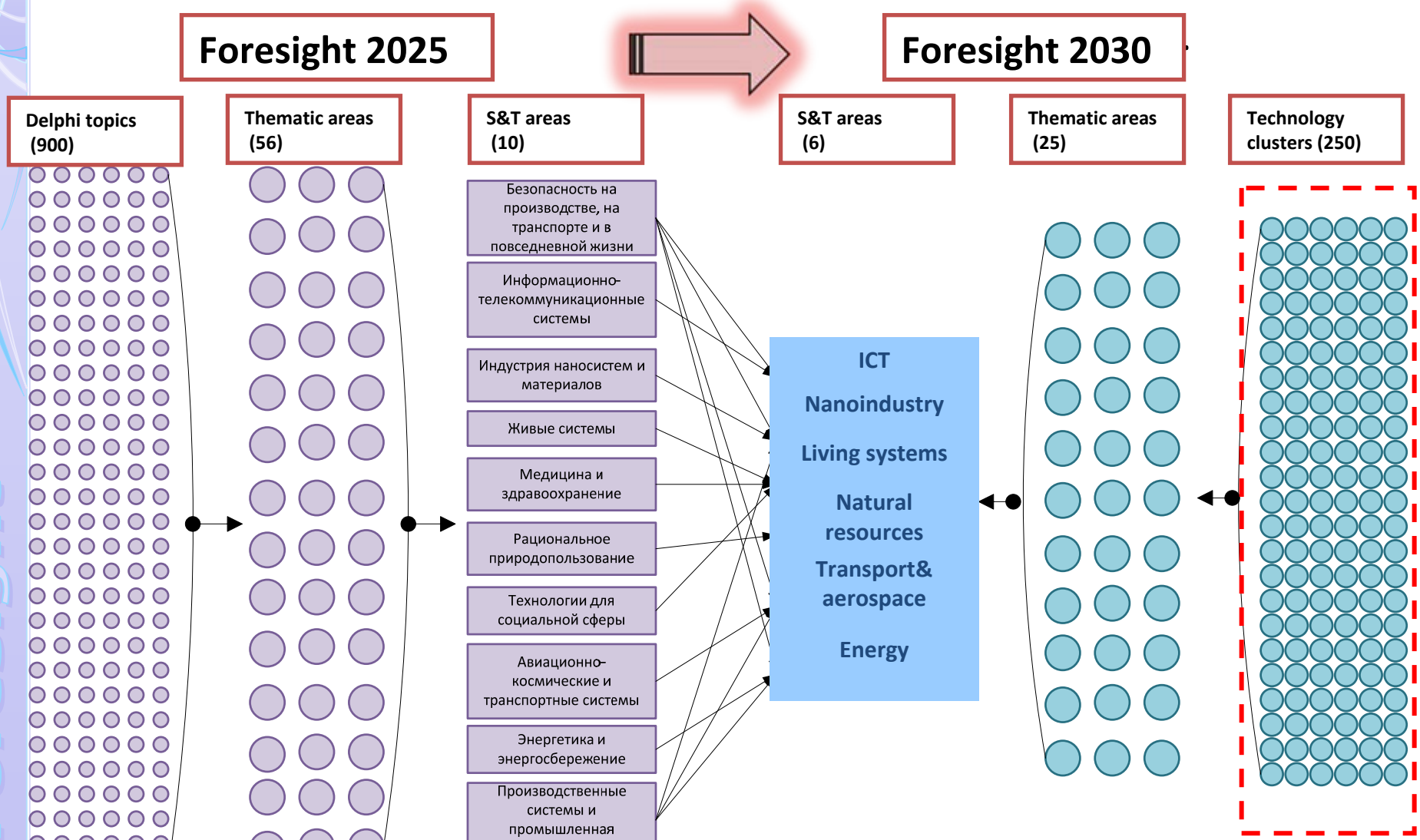
R&D level and importance



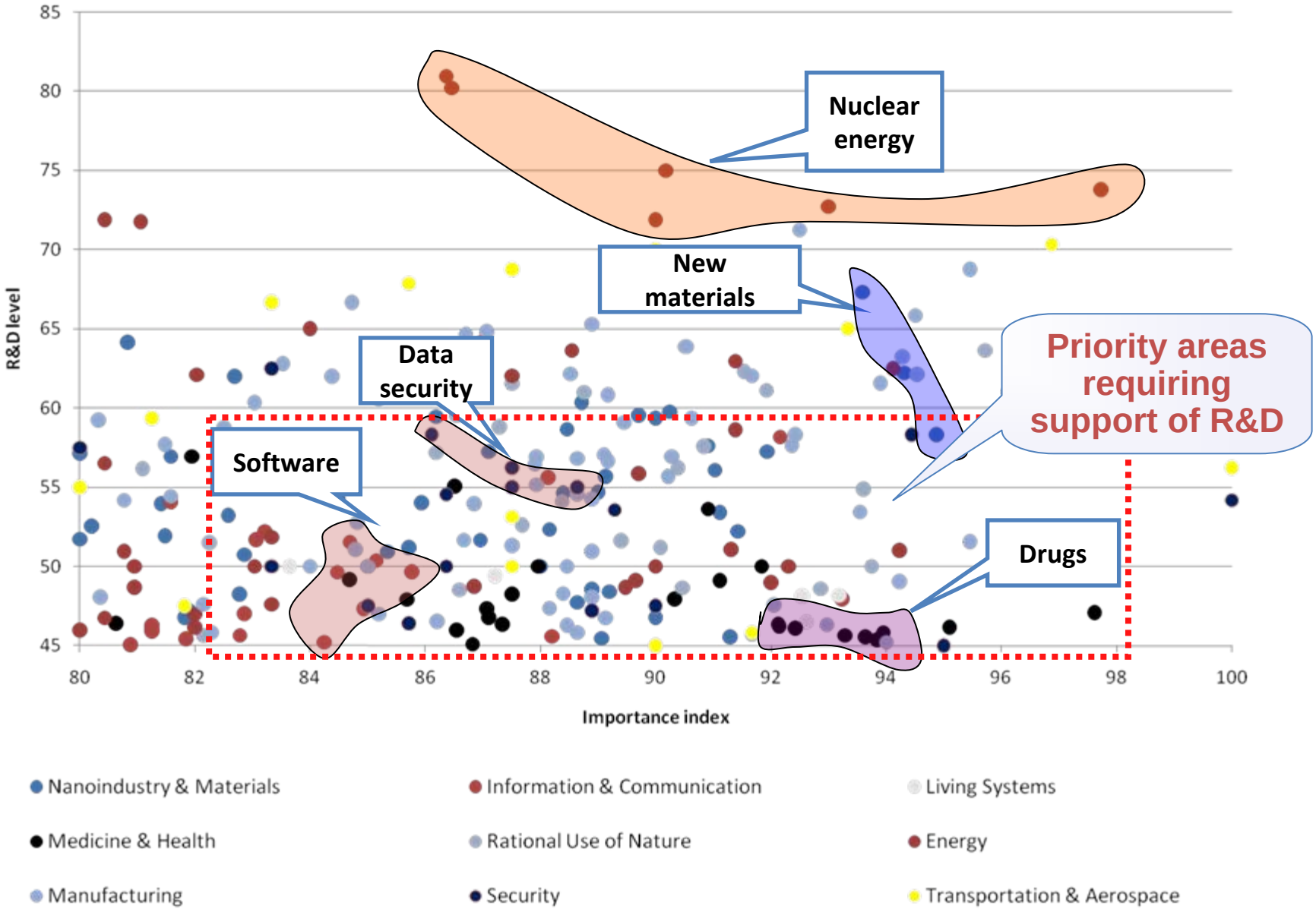
Topics with high R&D level and importance



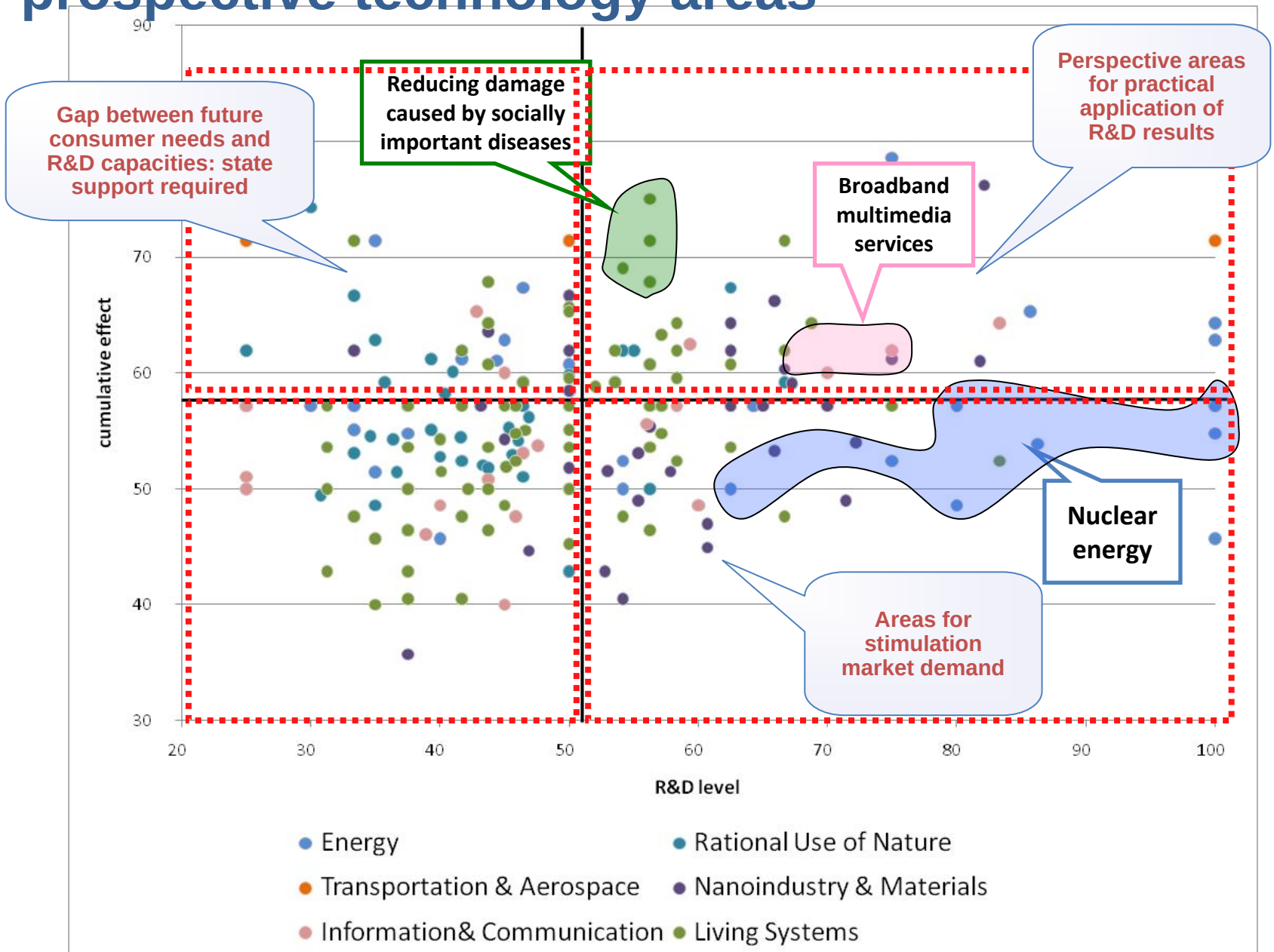
Structure of thematic areas



Foresight 2030: Promising technology areas



Foresight 2030: detailed assessment of prospective technology areas



Promising application areas

Living systems and medicine	Cell plants for growing therapeutic substances in industrial bioreactors Models for testing pharmaceuticals in vitro 3D cultivation of cells for growing tissues and organs for transplantation
Nanoindustry	Modeling structure and properties of functional nanomaterials Nanoparticles and nanostructures of different shape Nanostructuring by fragmentation under intensive plastic deformation Nanostructured biocompatible materials
ICT	Security of information systems and networks Semantic search of information in data bases and knowledge bases High-precision navigation based on space communication Software for parallel computing
Rational use of nature	Selective disintegration Reprospecting, extracting and transportation of hydrocarbons in Arctic shelf Increasing degree of extraction of liquid hydrocarbons
Transport and aerospace	Liquid-fuel rocket engines Fuel cells for transport Carrier rockets and take-off blocks
Energy	Small nuclear reactors Long-distance energy transportation Fast neutrons nuclear reactors

… and a number of other fields

Market oriented S&T Foresight

Global trends and challenges of S&T development

Scenarios of long-term S&T development

Identification of points of effort's application

External factors

Alternatives

Perspective market segments

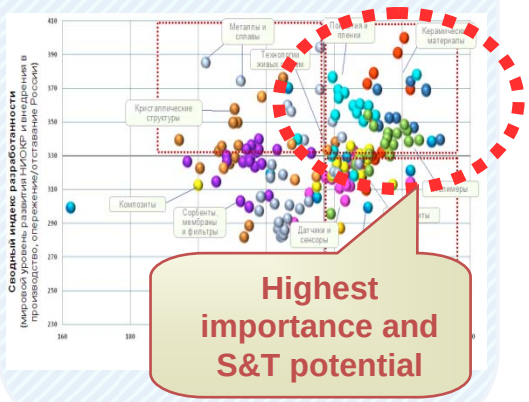
Innovative products and services

New technological solutions

R&D

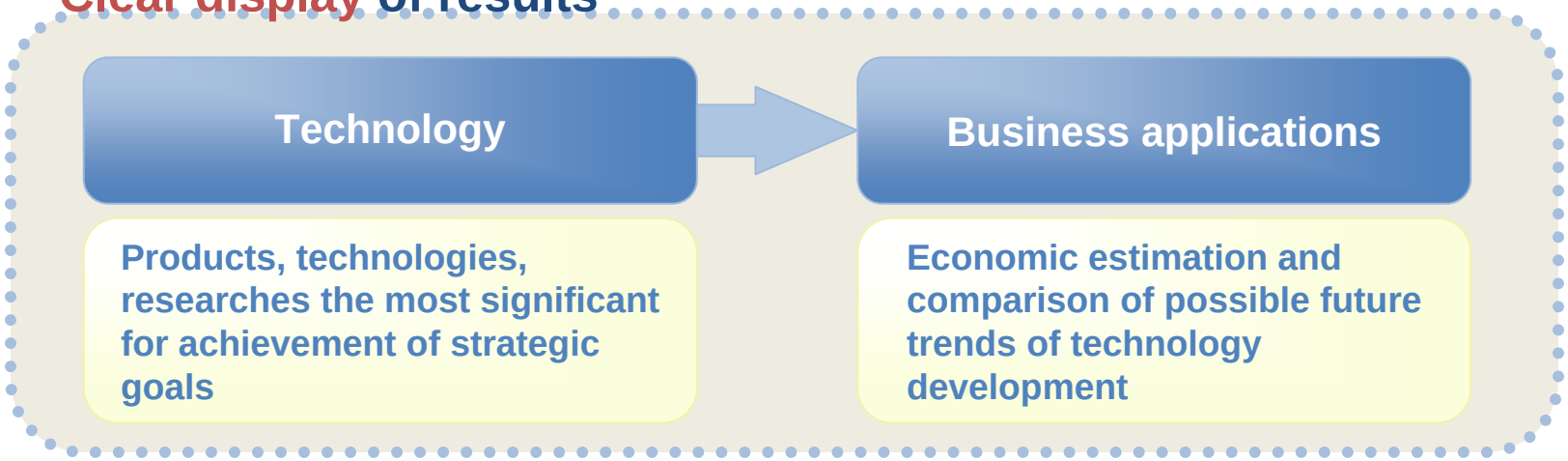
System of priorities

Roadmaps for priorities realisation



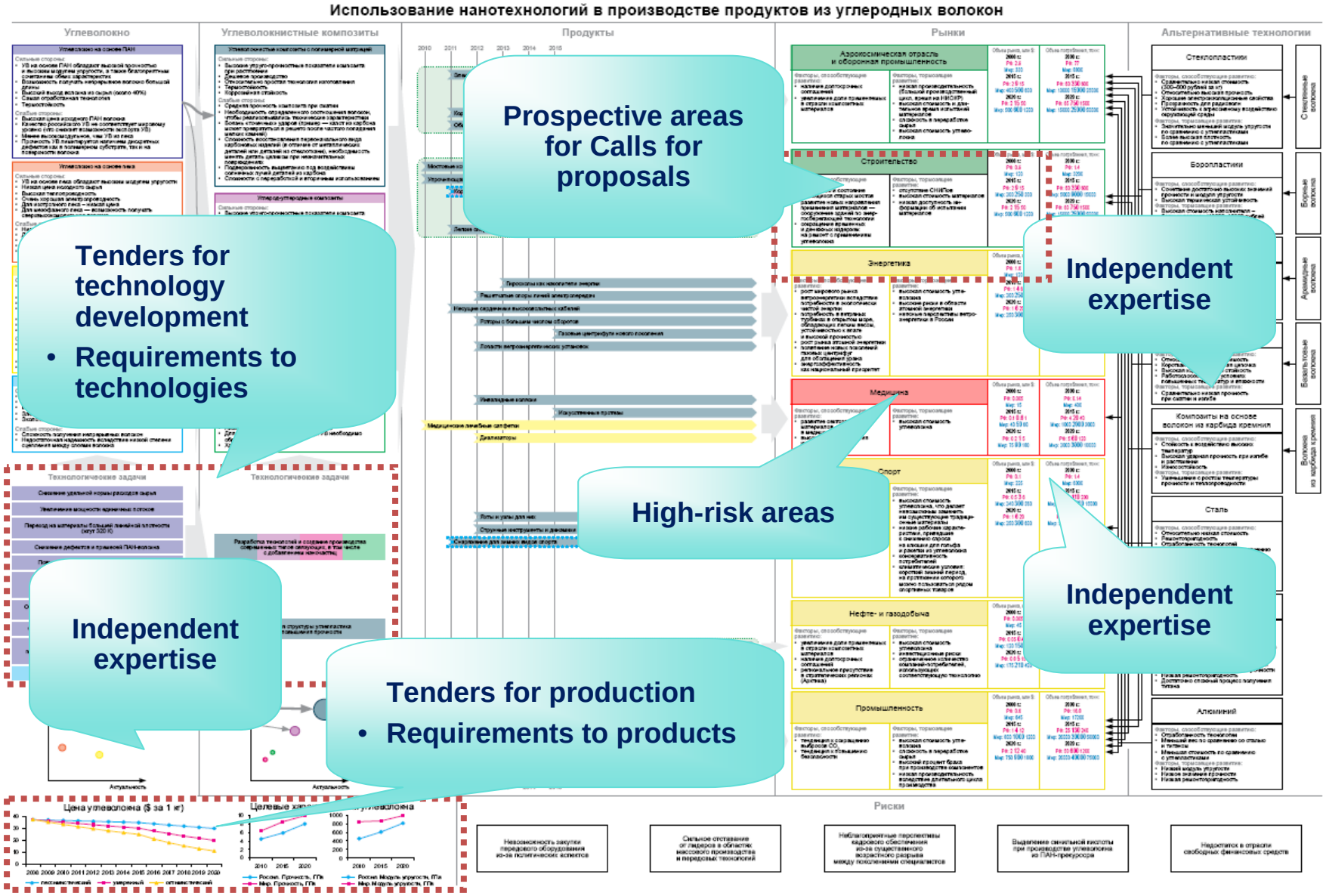
Major principles

- Complex foresight of markets, products, technologies, scientific researches
- Contribution of new technologies use to achieve the strategic goals, choice of most effective technology applications
- Existing "windows of opportunities", alternative ways to achieve the goals
- Coordination of actions and events time line, points of key decisions
- Clear display of results



Roadmap: principal components

Roadmaps as a policy instrument



S&T Foresight: further activities

Development of a network of Foresight Centres at leading universities

Integrated models for forecasting major S&T, innovation and education indicators

Dissemination and discussion of results

Involvement of businesses, technology platforms, development institutes, large companies

Analysis of global S&T trends

Analysis of S&T trends in Russia

Innovation challenges

S&T and innovation capacities

Expert and analytical studies

Expert panels (including business and foreign experts)

Foresight of S&T areas

Innovation markets and demand for technologies

Major sectors of economy

Priorities for technology modernisation

Integration to global value added chains

Areas to pursue global leadership

Macroeconomic scenarios

Foresight of Basic Research

Future demand for skills

Roadmaps for sectors and product groups

Innovation strategies for sectors of economy

Policy recommendations

S&T Priorities

Conclusions

1. Priority-setting in S&T&I is increasingly important for Russia
2. A strategic choice: whether to support “traditional” areas or to opt for emerging fields with potentially high economic and social return
3. Priority setting should be an integral part of policy-making
4. Macro, mission-oriented and thematic priorities should be clearly defined and interrelated
5. The Foresight studies have to be focused on policy agenda and based on a better ‘grounded’ approach (articulation of business demand, roadmapping for promising areas, evidence-based studies, integrated forecasting S&T, innovation and education indicators etc)
6. It will require a broader set of instruments (combination of qualitative and quantitative methods, weak signals and wild cards, horizon scanning et al)
7. To increase the quality of Foresight a wider coverage of experts is needed (including the demand side and international experts)
8. Regular monitoring and evaluation of Foresight can contribute to the quality assurance

Thank you!

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