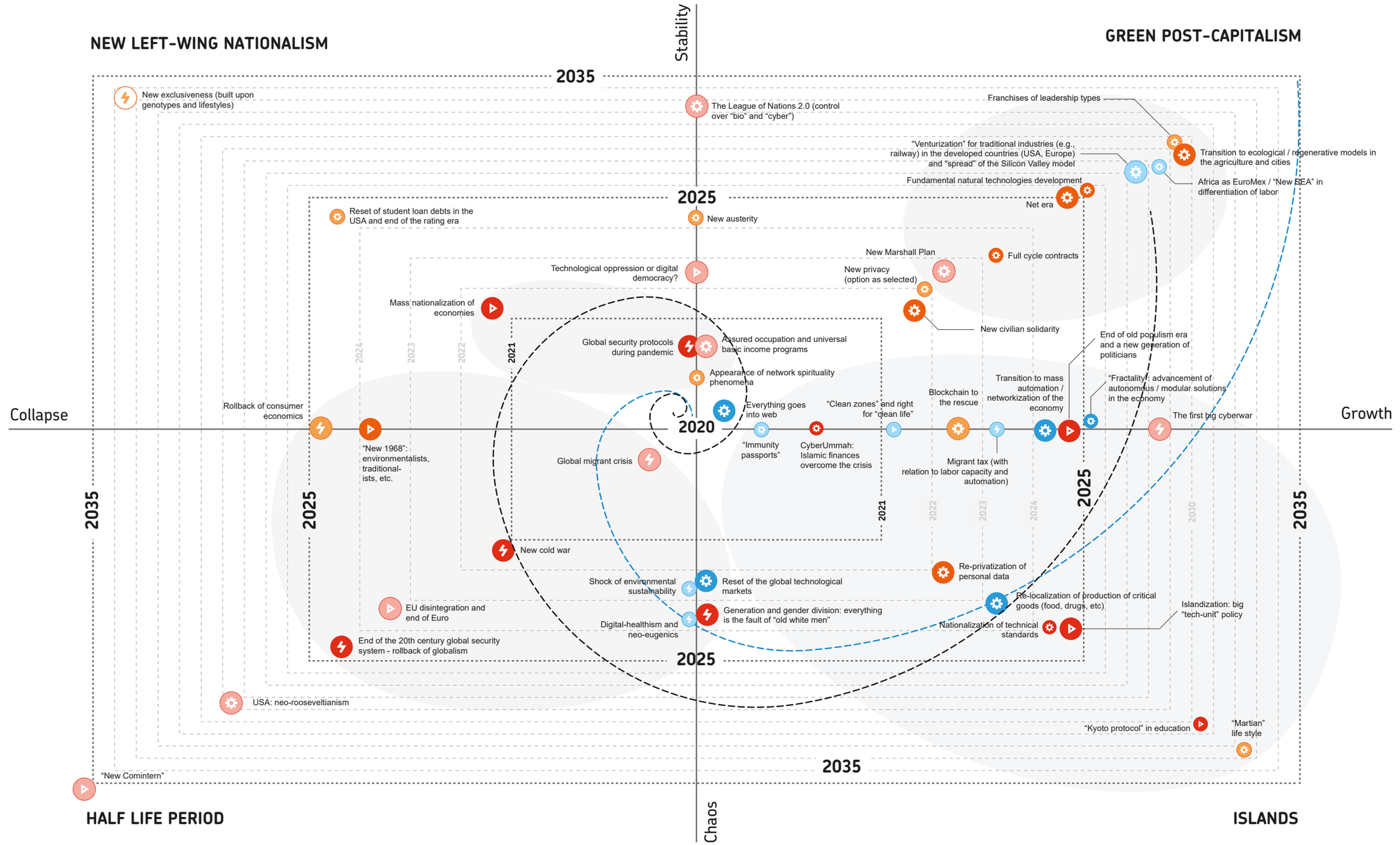
National
Technoløgy
Initiative

INFOGRAPHICS

2025

RESULTS OF 2020S FORESIGHT (1/2)

MOST PROBABLE SCENARIO SEQUENCE



Most probable scenario

The most desirable scenario for Russia

IMPACT: High, Average, Low

PROBABILITY: High, Average, Low

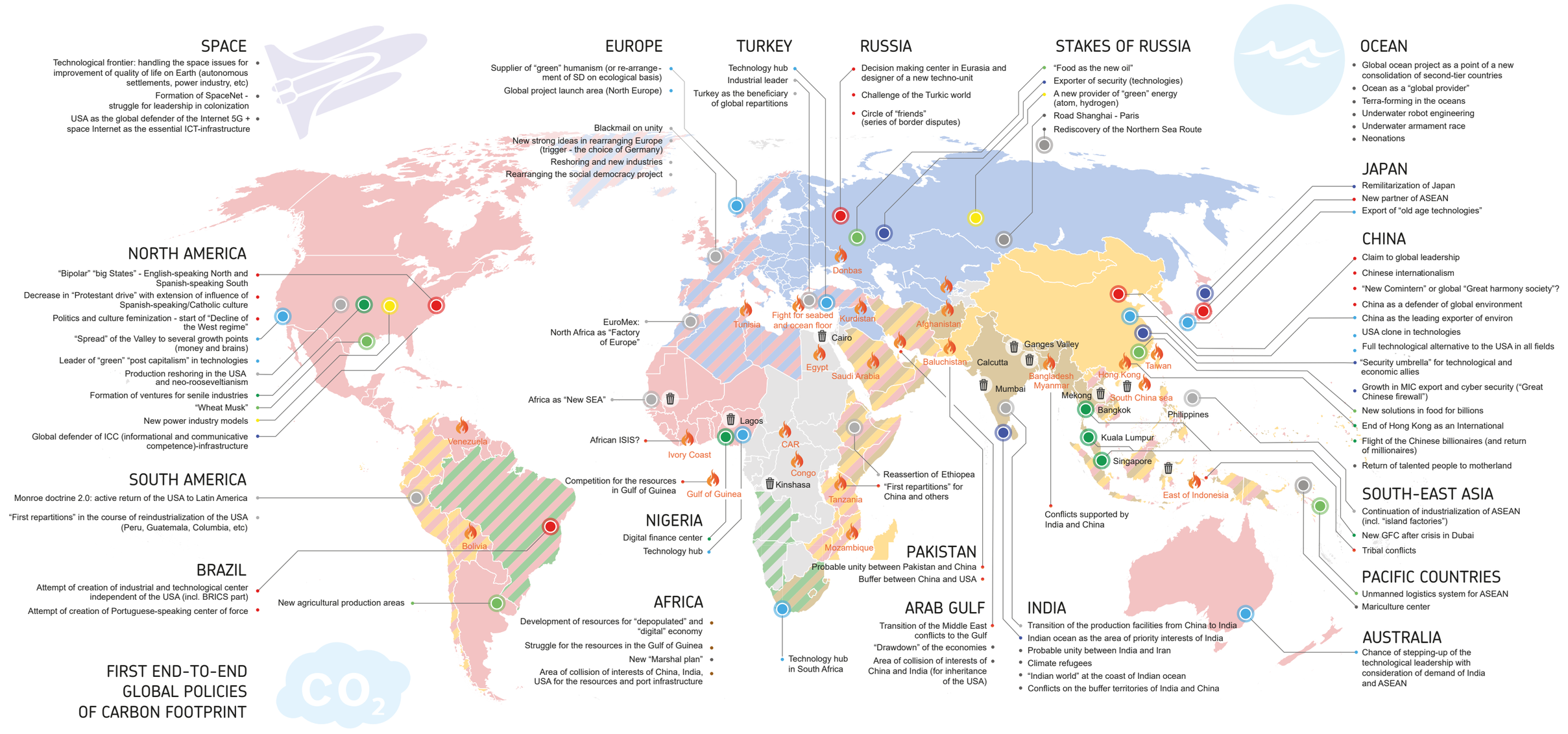
Opportunity, Threat, Fork

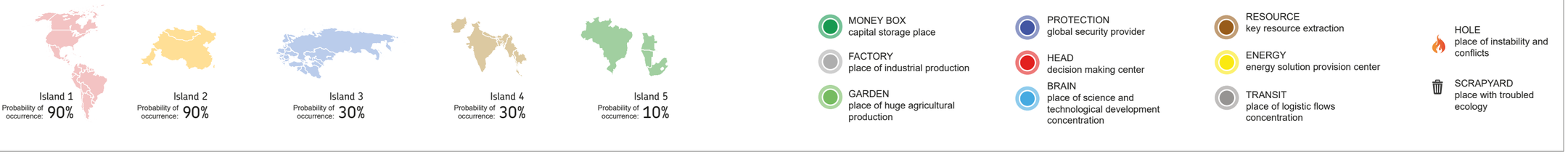
Fear, Comfort, Hope

*In case of trigger actuation some of the events happen faster than is shown on the map

RESULTS OF 2020S FORESIGHT (2/2)

KEY EVENTS AND TRENDS ON THE WORLD MAP





CENTENNIAL FORESIGHT

Challenges of the 21st century

We are rapidly entering the dynamics of “catastrophic development”, the “evolutionary pressure” is maximized.

Civilization finds itself at an inevitable fork in the road - either it changes the principles of its existence or it perishes. The solution is to make the process of sociocultural evolution not forced, but managed. Our challenge is to recognize the next level of complexity, taking us out of the disaster zone into a new stability.

“We must become architects of the future, not be its victims”

Richard Buckminster Fuller, American architect, designer, engineer, inventor, philosopher, mathematician, and writer.

Threats and changes

The threats of the coming decade - an ongoing global pandemic, waves of social protests in the West and East, Cold War tensions between the US and China - are strong enough to call into question humanity’s prosperous future. But beyond the horizon of the 2020s, a “long 21st century” lies before humanity. The ongoing transition does not imply a rejection of the resources and institutions of the existing global civilization, but will necessarily and radically rethink and transform them. The old governance structures and value systems will “dissolve” in the new civilizational contour - and the challenges of today will “dissolve” with them.

This is the time of “practices of the future” - new activities and formats of life. It is time for a new everydayness to emerge in the lives of every person, every community and every territory.

Foresight techniques

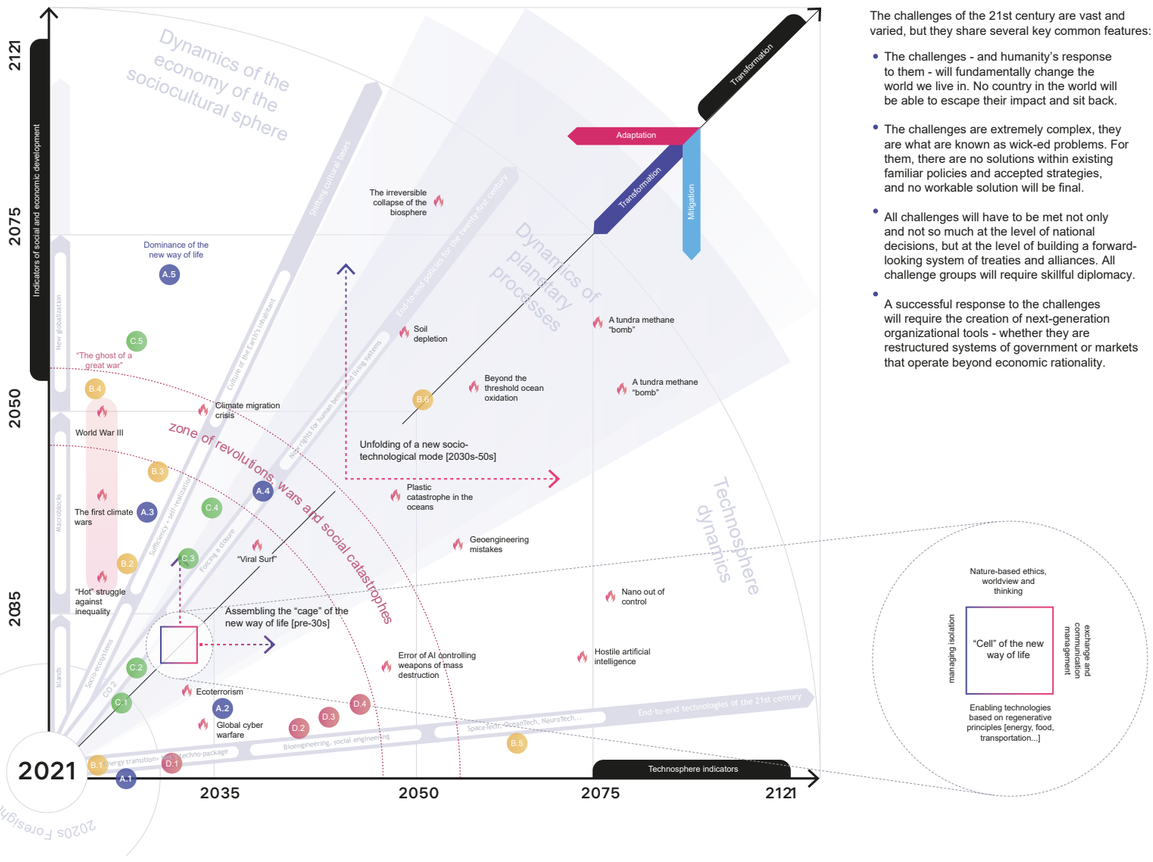
We have created a special method of work that combines the best global practices of long-term forecasting and programming.

The main session of the group work, which took place from July 21 to July 27, 2021 in Veliky Novgorod, involved more than fileading Russian futurologists, scientists, strategists, innovative entrepreneurs from all over the country - and more than ten international experts of the highest level, involved in the creation of long-term programs of country and world development on the topics of countries, cities, climate, future production and social activities and much more.

All of us, every inhabitant of planet Earth, from the super-rich of Manhattan to the slum dwellers of Mumbai, are not so much hostages as creators of the changes that are happening to us.

We have no way of predicting future events a hundred years into the future – but we can try to see the goals of our movement into the future and distinguish desirable scenarios from undesirable, possible from impossible.
We want to understand what methods we can use to pave the way to an inspiring and achievable future, and what that future might be.

Diagram of the key challenges of the 21st century. Map of events manifesting global ecosystem, technological and socio-cultural challenges



The challenges of the 21st century are vast and varied, but they share several key common features:

- The challenges - and humanity’s response to them - will fundamentally change the world we live in. No country in the world will be able to escape their impact and sit back.
- The challenges are extremely complex, they are what are known as wick-ed problems. For them, there are no solutions within existing familiar policies and accepted strategies, and no workable solution will be final.
- All challenges will have to be met not only and not so much at the level of national decisions, but at the level of building a forward-looking system of treaties and alliances. All challenge groups will require skillful diplomacy.
- A successful response to the challenges will require the creation of next-generation organizational tools - whether they are restructured systems of government or markets that operate beyond economic rationality.

Economy

- A.1 Energy transition
- A.2 Regenerative economics
- A.3 Economy of suffi ciency and self-realization
- A.4 Emission of new values
- A.5 Multi-level ecosystem management

Control systems

- B.1 End-to-end policies
- B.2 Preventive assimilation into the future
- B.3 Empathic management techniques
- B.4 Absolute weapon
- B.5 Political actors for new spaces
- B.6 The rights of post-human subjects

Socio-cultural practices

- C.1 Universities of the future cultivation
- C.2 Learning ecosystems for the full human lifecycle
- C.3 A culture of holistic health
- C.4 Culture of the Earth’s inhabitant
- C.5 Alternative habitat areas

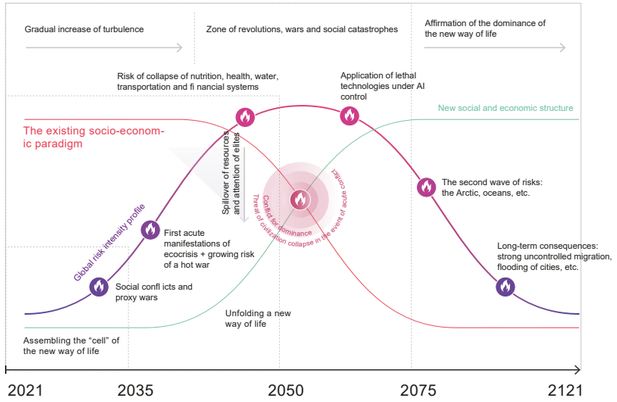
Worldview and thinking

- D.1 Feminist thinking
- D.2 Hybrid (collective) intelligence
- D.3 Engineering of anthropo-bio-techno-cenoses
- D.4 A meta-language of living complexity

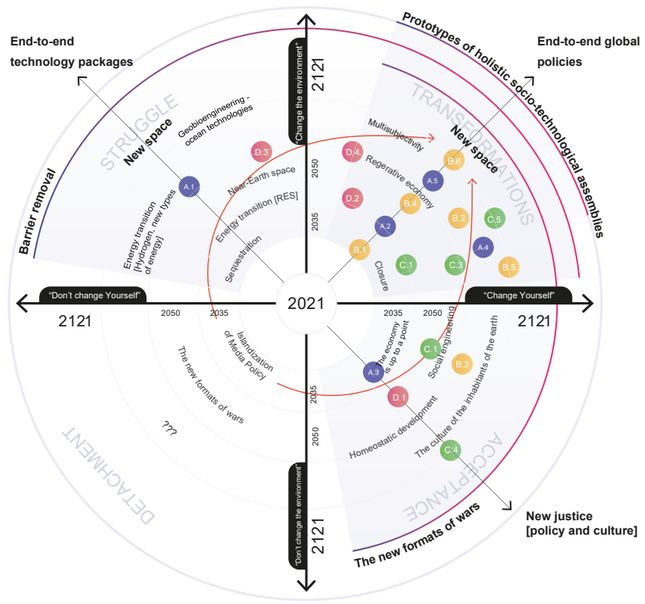
The following ten privileged directions have been identified by the Centennial Foresight as possible long-term priorities for our country:

1. Fulfilment of potential of Russia as the large-scale world holder of the natural capital.
2. Proactive position in terms of energy transition agenda: Russia shall form a long-term strategic environment with reference to the global energy transition.
3. Preventive measures on inevitable cascade of world disasters: Russia may become the world leader in dealing with emergency situations of all types, some kind of “World SES”.
4. The solution package for global security: provider of the basic food stuff for the territories affected by crisis-related and catastrophic exposures.
5. Development of the technologies for nature-based intelligent eco-systems (anthropo-biotechno- coenosis).
6. Integral health management system
7. Transition to educational eco-systems: the education shall accompany the man along the entire life journey - from birth to last days of his life.
8. Prototyping of “over-barrier” civilization: creation of the network of experimental small sustainable settlements constructed in the logic of “cooperation with the nature”.
9. The cultural values of the Russian civilization within the “Culture of the Earth’s inhabitant”.
10. Institution and practical experience in strategic dialogue about the future: establishment of communication involving the key stakeholders (including the business circles, social movements, activity communities) in different scopes from the local to national level.

Dynamics of crises and confl icts in the process of transformation



Decision Space: “stakes” of the Centennial Foresight and systemic moves



Humanity, very simplistically, has a few basic lines of behavior:

1. Confrontation (or mitigation): we can combat threats by changing the reality around us. New technologies are the main means of struggle.
2. Acceptance (or adaptation): we can accept the changes taking place as a new reality - and try to change our lifestyles, our culture and our thinking to meet the changing conditions.
3. Transformation (or conversion) is the most comprehensive strategy, where a “new assemblage point” is sought and then an attempt is made to change both “self” and “world.”
4. Denial (or desensitization): not a strategy of action, but rather a “strategy of inaction” - a situation in which growing challenges are deliberately ignored or pushed to the periphery of public debate, usually in the hope that they will “dissipate” on their own.

HORIZON 2040 (1/5)

PROJECT CONCEPT

Andrei Belousov

The Horizon 2040 project is an attempt to conceptualize Russia's identity. Russia declares itself as an active player in the world, on world platforms.

The question arises: what is Russia, what is its subjectivity? The answer to this question is very important, it is the basis of what all countries that have subjectivity and sovereignty have - a strategic dialog within society and between the state and society to develop basic concepts and ideologemes. We've had almost none of that so far, unfortunately, because it's a very complex topic.

Horizon 2040 is a platform for strategic dialog to define Russia's position in the international arena of 2040, as well as to propose scenarios for long-term domestic development in key areas.

> The project has already brought together more than 130 leading Russian experts in the fields of demography, ecology and climate, energy, technology, space, health, food, socio-culture, and economics.

Today, the international community finds itself in a historic period of breaking the political, economic and social order, launching the transition into a new format of world interaction.

To maintain its status as a leading world power, Russia must have a clear vision of its future and define its subjectivity.

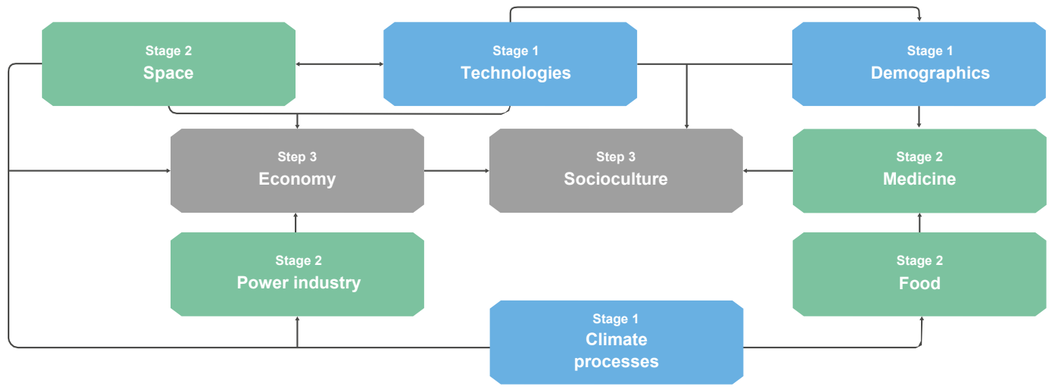
Understanding the direction of development of global and Russian socio-economic trends will allow us to form the main options for the vision of the future and try to elaborate long-term development strategies and create specific action plans.

Svetlana Chupsheva

We set ourselves the task of forming a vision of Russia's further development in various spheres and areas: from healthcare and food security to new technologies and the space industry.

This is how the Horizon 2040 special project came into being, where together with a large pool of experts, scientists, and analysts we develop scenarios and models for the development of society and the economy, explore opportunities to improve climatic conditions and demographics in Russia, as well as to maintain our country's leadership in the energy sector. Our project is open to all concerned and active citizens who are ready to participate in the fate of Russia.

Framework and sequence of work



Website of Horizon 2040

Horizon 2040 Report

Centennial Foresight

Foresight of the 20s

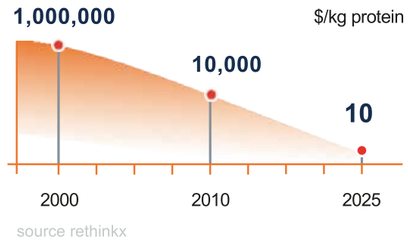
HORIZON 2040 (2/5)

Key issues:

- What trends are shaping the global food agenda?
- What are the key threats, challenges and opportunities facing the domestic agribusiness sector?
- Can the model of advanced development bring the industry to a fundamentally new technological and infrastructural platform?

World 2024

Biorevolution in precision fermentation



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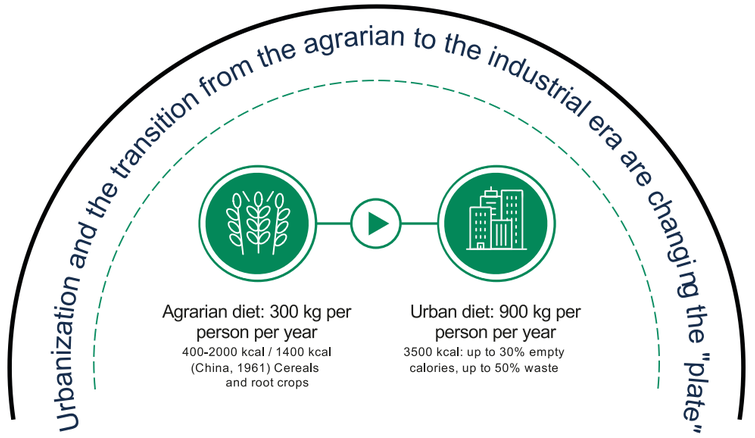


What will define the food market over the next 30 years?

- Growth in global food demand
- (in South-East Asia and Africa)
- Fighting for the health of nature (reducing the load per unit of nature)
- Climate change
- A healthy diet for urban
- Emergence of "breakthrough" technologies in food production

Promising · Doubtful-promising · Futile

Protein sources

BASIC TECHNOLOGIES

- **LIVESTOCK BREEDING** (milk and meat)

- **AQUACULTURE** (breeding and cultivation of aquatic organisms)

- **PROTEIN FROM ALGAE**

- **CROP PRODUCTION** (plant-based meat and milk)

BIOTECHNOLOGIES

- **PROTEIN FROM MUSHROOMS**

- **PROTEIN FROM MICROORGANISMS**

- **"CELL MEAT"**

- **ALTERNATIVE PROTEIN SOURCES**

Sources of fats

BASIC TECHNOLOGIES

- **LIVESTOCK BREEDING**

- **CROP PRODUCTION**

- **ALGAE OIL**

BIOTECHNOLOGIES

- **MICROBIAL FAT**

- **"CELLULAR FAT"**

Sources of sugar substitute

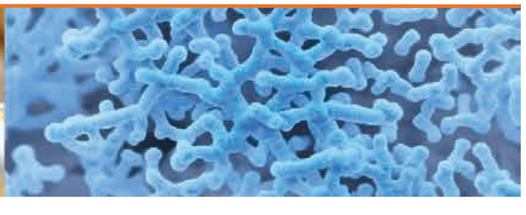
BASIC TECHNOLOGIES

- **CHEMICAL** (aspartame)

- **VEGETABLE** (stevia)

BIOTECHNOLOGIES

- **SWEET PROTEINS**



- **CASCADE FERMENTATION**

HORIZON 2040 (3/5)

Russia 2040

Russia should be one of the beneficiaries of the growing global demand for food. Although today its exports exceed $41 billion a year, this is two to three times less than the leading countries supply to the world market.
Development of exports of a wide range of agricultural products and foodstuffs to almost 160 countries already stimulates new investments, construction of modern enterprises, attraction of highly qualified personnel to the industry.

The challenges of today:

- Dependence on genetic material in crop production and livestock breeding
- Dependence on technology to ensure efficiency
- Human capital deficit (in science, production and agriculture)

The challenges of tomorrow:

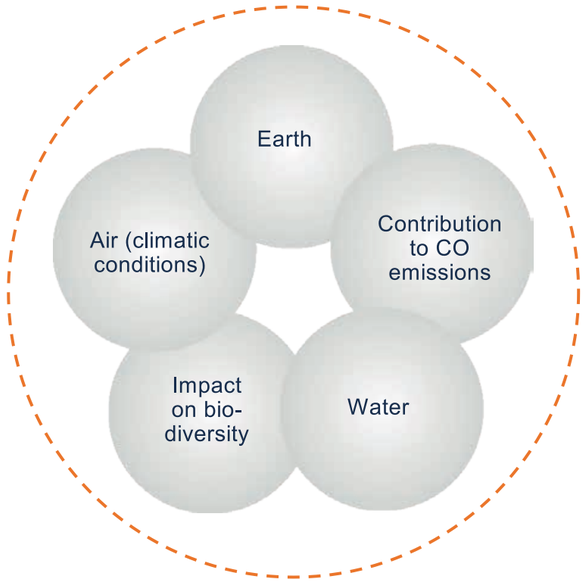
- Threat of losing stable markets (China and India)
- Redistribution of food import-dependent markets through new technologies
- Loss of soil fertility

The Russian North and the ideas of Sergei Zimov

- Permafrost thawing and the "methane bomb"
- Pastoralism as a source of animal protein

Efficiency per unit of nature

- Alternative system for assessing the prospectivity and "greenness" of technologies



1. Protecting what we have

- Technical regulations inside
- Export support

Risk: the probability of a future drop in demand for agro-industrial products from today's importers.

EXPORT 2040

$50-60 billion

Options / scenarios

2. Advance development and betting on the high limit

Creating our own knowledge economy through the transformation ofthe business-science-state socio-economic model.

Prerequisites:

- Russian science in biotechnology
- Resources for the high end

The challenge is to transform the socio-economic model.

EXPORT 2040

$100-150 billion

Food in Russia – horizon 2040

Russia is a global player in food

access to technology / geopolitical influence / own green revolution / 200 million tons of grain, 46 million tons of oilseeds, 18 million tons of meat

Russian Biotech

import substitution in minor ingredients and advanced development in new technologies

Proprietary genetics

crop production and livestock breeding

Stewardship of resources

efficiency, unit of nature, waste, healthy lifestyle

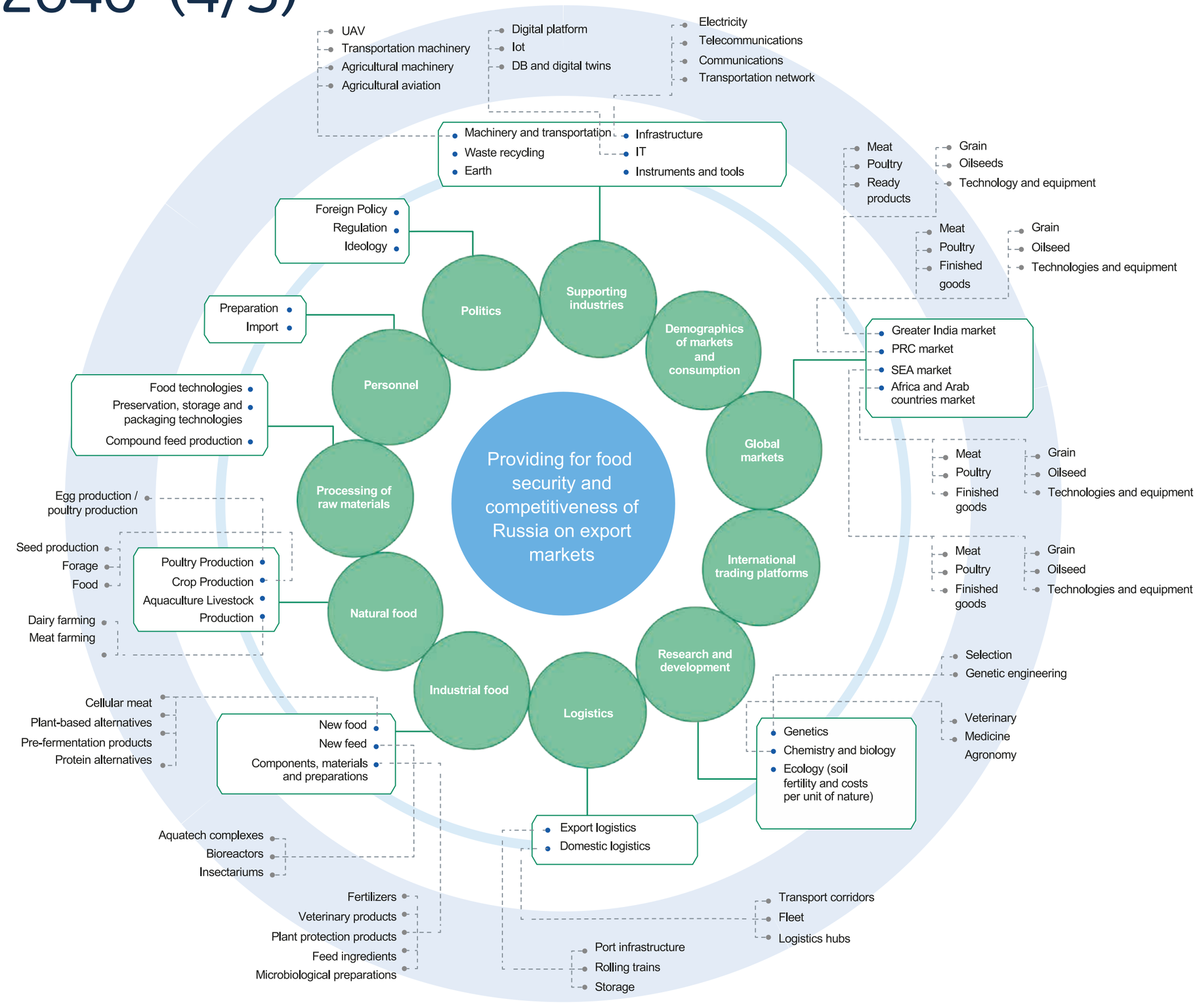
Africa

import leader in the new growing food market

HORIZON 2040 (4/5)

Safety

Factor tree



HORIZON 2040 (5/5)

FOOD

Challenges and solutions

SCENARIOS

Rough escalation

Agro-industrial complex disconnection from international cooperation caused by sanctions

Provocation of collapse in the Russian agro-industrial complex as a result of escalation of sanctions pressure from Western countries in all areas of cooperation: termination of supplies of technologies, equipment, reproductive materials, ingredients and shutdown of operating units.

Soft escalation

Forcing Russia out of world markets by non-market methods

Provocation of refusal to consume Russian food by creating an unacceptable image of Russian products as allegedly unethical, unhealthy, unecological (dirty).

Missing technological leap.

Lagging behind in breakthrough technologies for affordable, healthy and environmentally friendly food

Loss of "tomorrow's" markets and strategic competitiveness as a result of the lack of focus on the development of scientific, technological and human resource base for the creation and scaling of new-generation technologies (industrial production of alternative proteins and fats, cellular meat, precision fermentation, etc.).

"Force Majeure"

Inaccessibility of markets due to force majeure circumstances

Loss of opportunity to export agro-industrial complex products and disruption of technological and logistical chains as a result of military actions, pandemic, sabotage, natural and man-made disasters. Closing the Straits. Failure to deliver products to buyer countries.

"Not ready for a change in demand patterns"

Loss of existing markets as a result of changes in demand

Falling revenue of the Russian agro-industrial complex as a consequence of demographic, cultural, political changes in foreign markets, primarily in China and India (population decline, change in consumption structure, change in consumer stereotypes, policy of self-sufficiency of importing countries).

"There's no one to work in the countryside."

Acute shortage of qualified personnel in the agro-industrial complex

Inability to achieve the set goals of the agro-industrial complex development due to the lack of trained personnel in rural areas due to the mismatch of living and working conditions to the demands and expectations of modern man.

ROADMAPS

Toward technological sovereignty in the agro-industrial complex

Providing for long-term sovereignty of the agro-industrial complex through its own technological breakthroughs

Development of a systematic approach to long-term investments in scientific, technological, personnel potential and infrastructure of the agro-industrial complex, as well as closure of technological vulnerabilities, based on the priorities of the state.

Responding to Challenges: "Rough Escalation" and "Missing technological leap"

A Shield for the Bioeconomy

Providing for Russia's security against biological threats in the food sector

Creation of mechanisms for monitoring, control and protection of the environmental space and food market of Russia against biological threats (genetic bombs, biological sabotage, products dangerous to health).

Responding to Challenges: "Rough Escalation" and "Missing technological leap"

"Honest food is Russia's gift to the world."

Forming the image of Russian food on foreign markets as a humanitarian act

Creating and promoting, togetherto sanctions, political games and act as a means of pressure (e.g.: creating an "effective unit of nature" standard rather than "carbon neutrality"; "fair food for all"; with our allies in international organizations, global legal and media spaces, a policy to treat food as an asset of all humanity that cannot be subject promoting the concept of "food is not a weapon").

The answer to the challenge: "Soft escalation"

"A New Image of the Village."

Creating an attractive way of life in rural areas and work in the agro-industrial complex through technological transformation

Transformation of spatial and technological infrastructure of the village in order to meet the demands of highly qualified specialists and young people from Russia and other countries for quality of life and opportunities for self-realization, not inferior to modern megacities.

Response to the challenge: "There is no one to work in the countryside"

"Leadership in the New Food Paradigm."

Capturing promising markets by shifting to a model of personalized food production and consumption through the restructuring of technology chains

Providing for Russia's competitiveness in promising food markets by taking the lead in promoting a new paradigm of personalized food production and consumption and corresponding restructuring of the technological chains of food production, storage, processing and delivery to the end consumer (e.g., the concepts of "food as medicine", "ready-to-eat food", long-term storage technologies, etc.).

Response to challenges: "Soft escalation", ":ithe technological leap", "Force majeure", "Not ready for changes in the structure of demand", "No one to work in the countryside"

"Expansion into new regional markets."

Formation of new promising markets for Russian foodstuffs

Providing for sustainable presence of Russian food in the growing markets of Africa and Southeast Asia.

Response to challenges: "Force majeure", "Not ready to change the structure of demand"

"New Logistics Corridors".

Formation of export infrastructure to supply food to foreign markets via reserve routes

Providing for sustainable presence of Russian food in the growing markets of Africa and Southeast Asia even if the possibility of supply via the Black Sea is closed.

Responding to challenges: "Force Majeure"

TECHNOLOGICAL SOVEREIGNTY CHALLENGES

METHODS FOR IDENTIFYING KEY TECHNOLOGIES (1/2)

National strategies

- are based on approaches created in the 1970-1990s (TRL, Gartner MagicQuadrant, etc.)
- create lists of technologies without assessing their impact on achieving technological sovereignty
- are based on unilateral promotion of interests in foreign markets
- do not provide a basis for the implementation of equal partnership and international programs to achieve technological sovereignty

USA

List of critical and new technologies - a tool for shaping the strategy of technological competitiveness and national security:

— Advanced computing techniques
— New engineering materials
— Gas turbine engine technologies
— Advanced network management of sensors and signatures
— Modern production
— Artificial intelligence
— Biotechnologies
— Production and storage of clean energy
— Privacy, data protection and cybersecurity technologies
— Power industry
— Highly automated systems and robotics
— Human-machine interfaces
— Hypersonic technologies
— Integrated communication and networking technologies
— Location, navigation and time technologies
— Quantum information and assistive technologies
— Semiconductors and microelectronics
— Space technologies and systems

Source : https://www.whitehouse.gov/ostp/news-updates/2024/02/12/white-house-office-of-scien.ce-and-technology-policyreleases-updated-critical-and-emerging-technologies-list/

EUROPEAN UNION

Strategic Technology Platform of 11 programs across three targeted investment areas:

1. Digital technologies and high-tech innovations
2. Clean and resource-efficient technologies
3. Biotechnologies

Previously announced technology initiatives:

— Advanced materials for industrial leadership
— Zero Emissions Industry
— Search, processing of critical raw materials and materials (lithium, cobalt, nickel, gallium, raw boron, titanium, tungsten), ensuring supply chain security
— Microelectronics (new generation chips)
— Closed-loop economy
— Secure satellite communications for critical infrastructure and motion control of autonomous spacecraft (high-speed satellite Internet, mobile broadband satellite communications, satellite networks for computing and the Internet of Things)

Source: https://strategic-technologies.europa.eu/index_ en

CHINA

Fourteenth Five-Year Plan for National Economic and Social Development of the PRC and Long-Term Goals Forecast for 2035

S&T Priorities:

— New generation information technologies
— Biotechnologies
— New and hydrogen energy
— New materials
— Quantum Informatics
— Genetic technologies
— Development of maritime airspace and outer space
— Energy saving
— Comprehensive design of integrated transportation systems
— Renewable energy sources (increasing share in total energy sources)
— Environmental technologies that promote economic development

Source : https://www.gov.cn/xinwen/2021-03/13/content_SS92681.htm

TECHNOLOGICAL SOVEREIGNTY CHALLENGES

METHODS FOR IDENTIFYING KEY TECHNOLOGIES (2/2)

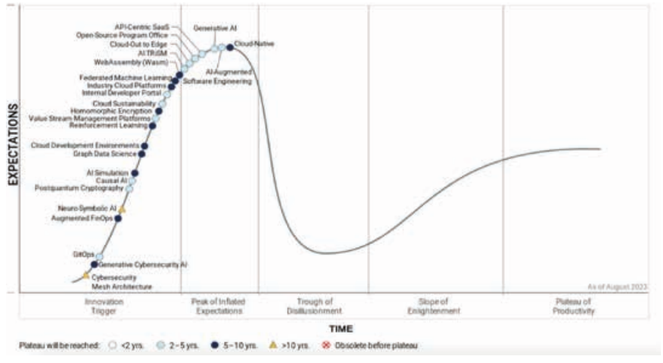
International think tanks

- meet the interests of investors, business objectives and product strategies of big companies
- use a marketing-driven approach in promoting technologies
- do not provide a unified framework for achieving technological sovereignty at the national level

Large-scale marketing campaigns

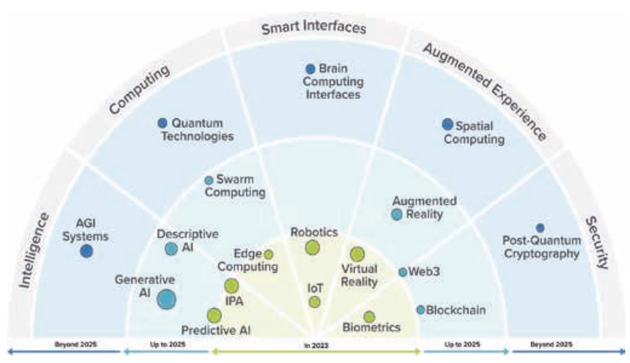
- Industry 4.0 (Germany)
- Metaverse (Meta*)
- One Belt, One Road (China)

Russia (according to the classifier of the Ministry of Education and Science of Russia, Ministry of Economic Development of Russia, Ministry of Industry and Trade of Russia) uncritically uses outdated approaches oriented to a different economic structure



GARTNER curve

A marketing tool for technology promotion, reflecting investors' attention and the level of technology adoption at different stages of the product life cycle



IDC RADAR (INTERNATIONAL DATA CORPORATION)

Assessment of technology maturity and the number of organizations planning to adopt the technology in the short, medium and long term

BCG "MATRIX"

A marketing tool for analyzing business products in 1970, relevant to the previous wave of globalization and focused on getting maximum market share for companies

What might the Russian method look like?

1. Focused on technological sovereignty
2. Focused on critical and end-to-end technologies
3. Clear, transparent and attractive for friendly countries

* Prohibited in the Russian Federation

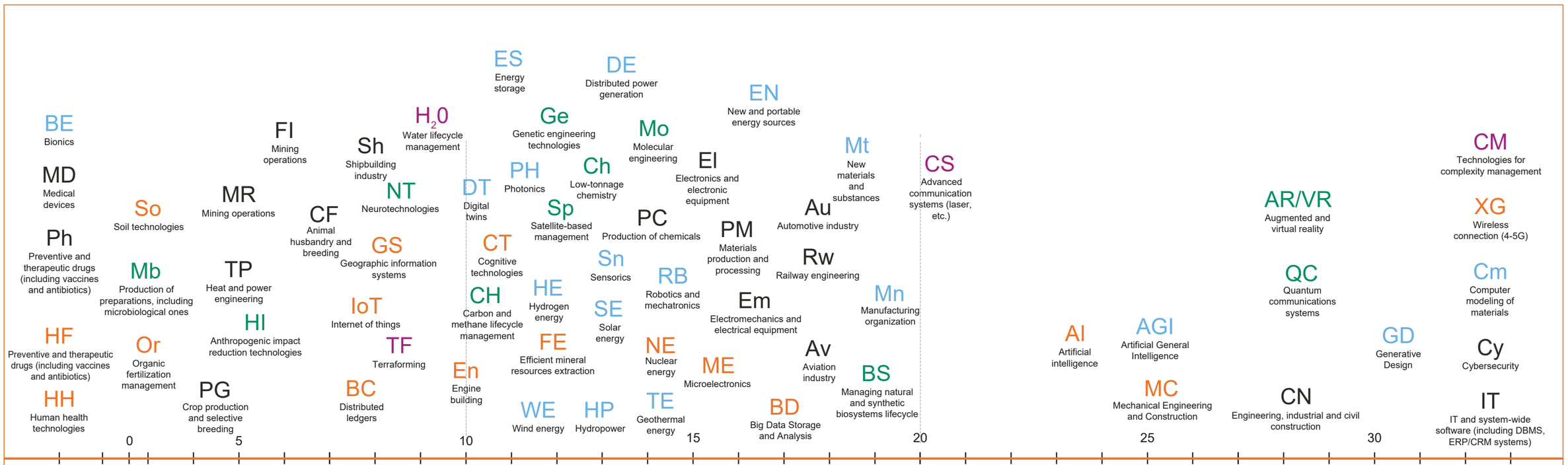
TECHNOLOGICAL SOVEREIGNTY CHALLENGES

TECHNOLOGY ASSESSMENT SCALES AND CALCULATION OF IMPACT ON SOVEREIGNTY (1/6)

W1
0.3
WEIGHT

K1. "Valence" (degree of "End-to-end ability")

Is calculated on an estimate of the number of specialized applications of a technology in industries END-TO-END ABILITY = N(applications). The highest K1 score is assigned to the technology that has the most specialized applications.



number of specialized applications of the technology in various industries and spheres of activity

K1=1 if the number of special applications is <10

K1=2 if the number of special applications is >=10, but <20

K1=3 if the number of special applications >=20

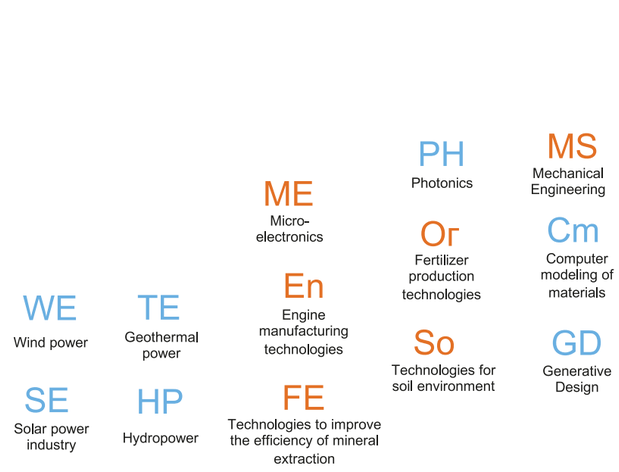
TECHNOLOGICAL SOVEREIGNTY CHALLENGES

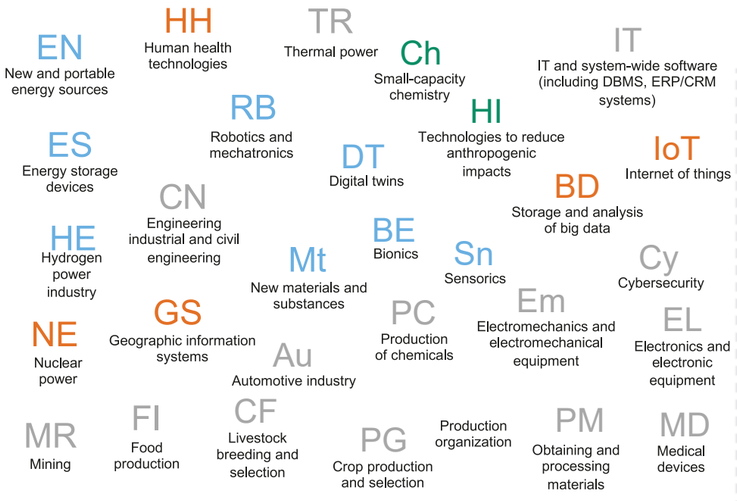
TECHNOLOGY ASSESSMENT SCALES AND CALCULATION OF THE IMPACT ON SOVEREIGNTY (2/6)

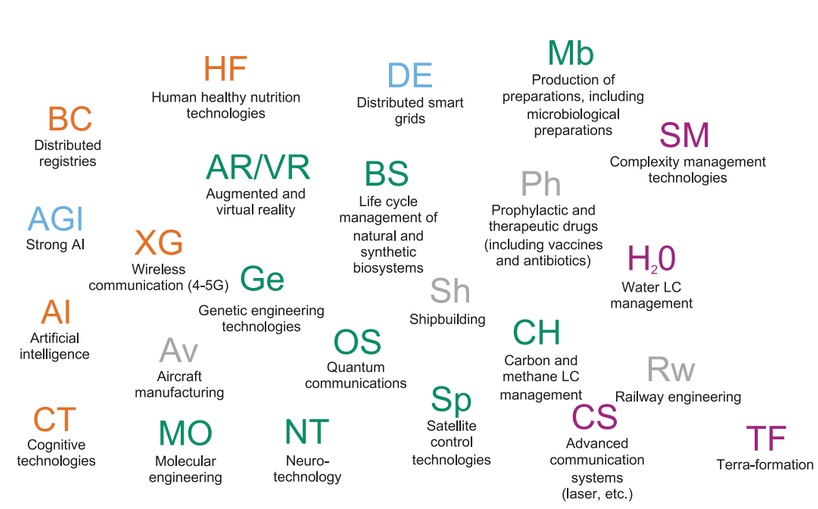
W2
0.2
WEIGHT

K2. Degree of complexity of the technology in terms of managing complexity

Is calculated by expert opinion on the complexity of the implemented systems and degree of necessary regulation. The highest K2 score is given to the technology that produces the most complex systems.







K2=1	the emerging system is stably predictable and characterized by minimal internal dynamics (regulated at the level of standards)	K2=2	the emerging system is characterized by medium internal dynamics and predictability (regulated at the level of policies)	K2=3	the emerging system is characterized by high internal dynamics, which leads to its self-complication (regulated at the level of ethics)

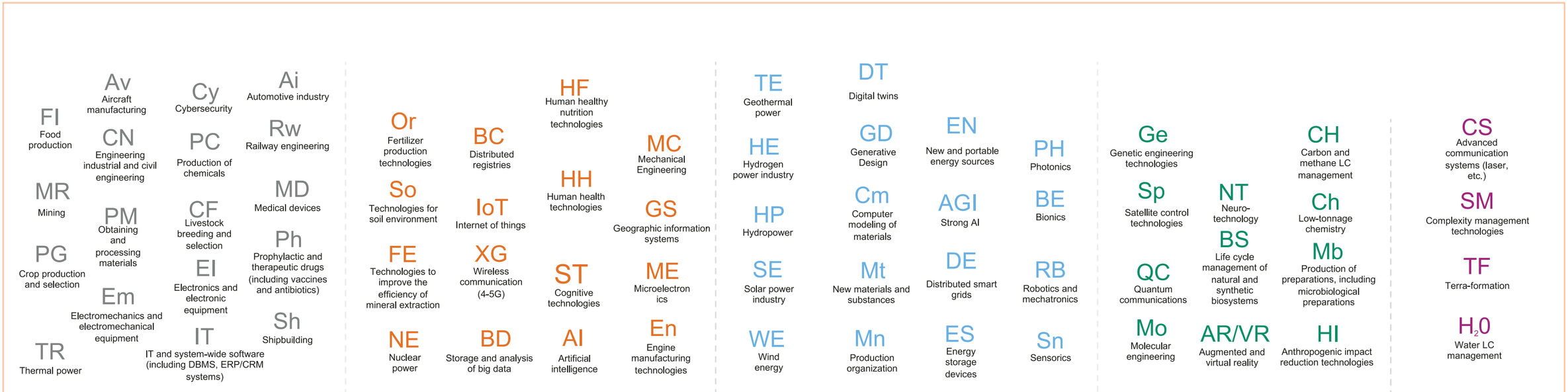
TECHNOLOGICAL SOVEREIGNTY CHALLENGES

TECHNOLOGY ASSESSMENT SCALES AND CALCULATION OF THE IMPACT ON SOVEREIGNTY (3/6)

W3
0.2
WEIGHT

K3. Maturity period

Is calculated according to the market research on the technology package readiness performed by analytical agencies. The highest score for the K3 indicator is assigned to the most mature technology, because at the time of calculation it can have the greatest impact on the achievement of technical sovereignty.



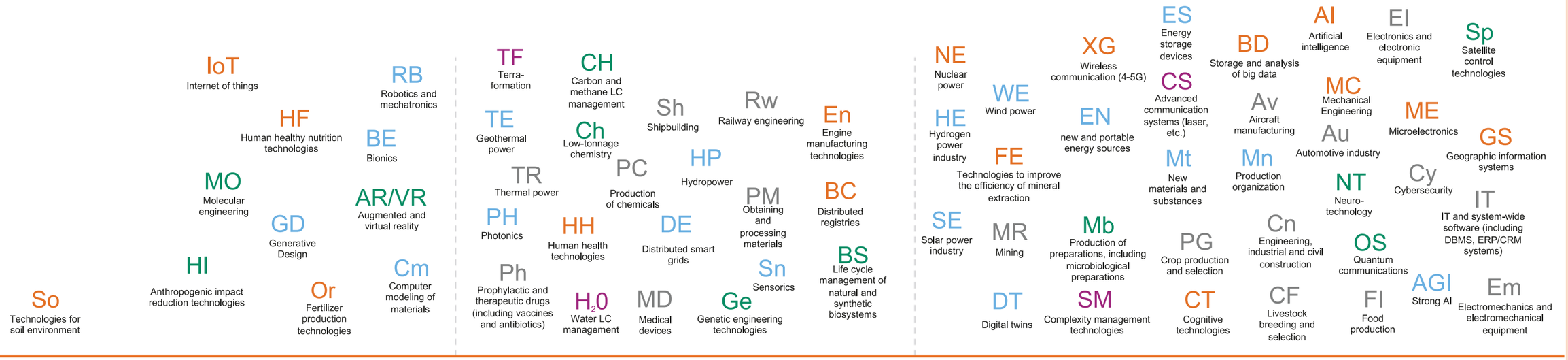
TECHNOLOGICAL SOVEREIGNTY CHALLENGES

TECHNOLOGY ASSESSMENT SCALES AND CALCULATION OF THE IMPACT ON SOVEREIGNTY (4/6)

W4
0.2
WEIGHT

K4. Degree of impact on critical infrastructure

Is calculated based on expert opinion on degree of impact the technology has on the state's critical infrastructure. The highest K4 score is assigned to a technology that has a direct impact on a country/state's CI.



No impact on critical infrastructure

K4=1

Indirectly affects critical infrastructure

K4=2

Directly affects critical infrastructure

K4=3

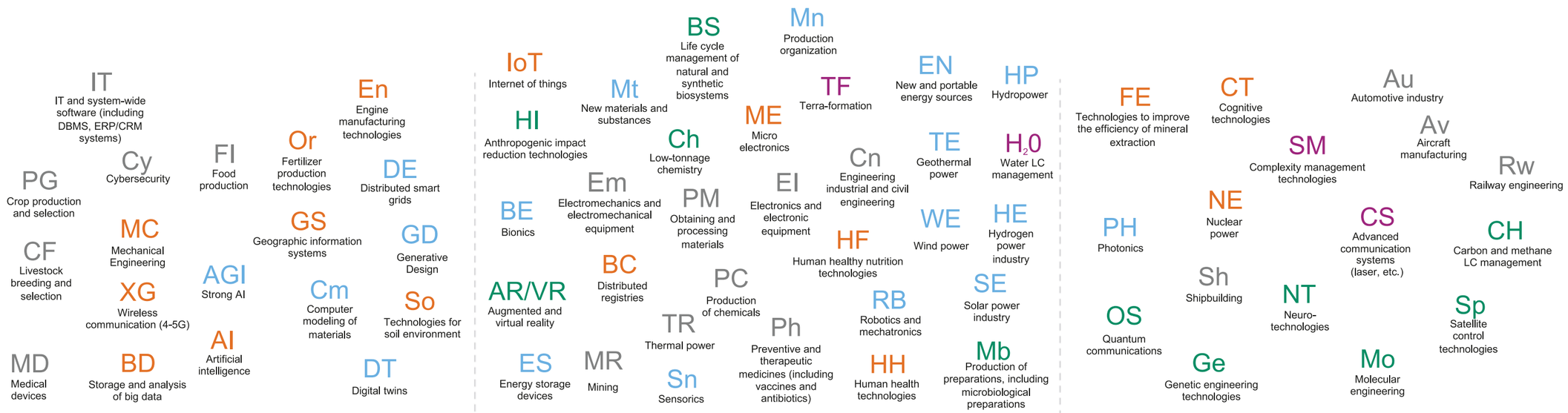
TECHNOLOGICAL SOVEREIGNTY CHALLENGES

TECHNOLOGY ASSESSMENT SCALES AND CALCULATION OF THE IMPACT ON SOVEREIGNTY (5/6)

W5
0.1
WEIGHT

K5. Length of the technology investment cycle

Is calculated on the basis of analytical studies of agencies on the payback period of technology projects. The highest score for the K5 indicator is assigned to the technology with the shortest investment cycle, since its implementation can most quickly produce a positive economic effect.



K5=3, if investment cycle duration is <5 years

5

K5=2, if investment cycle duration is >=5 years, but <10 years

Duration of investment cycle (years)

10

K5=1, if investment cycle duration is >=10 years

TECHNOLOGICAL SOVEREIGNTY CHALLENGES

TECHNOLOGY ASSESSMENT SCALES AND CALCULATION OF THE IMPACT ON SOVEREIGNTY (6/6)

TS. Comprehensive assessment of the technology's impact on sovereignty

To be calculated as a weighted average as per K1-K5 criteria.
The highest score (2 or more) means that the technology has a direct impact on sovereignty and should be developed first.

$$TS = K1xW1 + K2xW2 + K3xW3 + K4xW4 + K5xW5$$

0	No impact on technological sovereignty	1	Indirectly affects technological sovereignty
2	Direct impact on technological sovereignty		

TECHNOLOGICAL SOVEREIGNTY CHALLENGES

"PERIODIC TABLE" OF TECHNOLOGIES (1/2)

SECOND EDITION
2024-05-12

The estimate is made for the horizon 2020 - 2030 and may dynamically change in the future

The evaluation of technology indices by scales is of expert character and is given to illustrate end-to-end technologies that have the greatest impact on technological sovereignty

"Valence" (degree of "end-to-end ability" / "penetrability") of the technology

20

Cn [2,9] Engineering, industrial and civil construction COMPLEXITY 2 CRIT 3 INVEST 2	**IT** [3,0] IT and system-wide software (including DBMS, ERP/CRM-systems) COMPLEXITY 2 CRIT 3 INVEST 2	**Cy** [3,0] Cybersecurity COMPLEXITY 2 CRIT 3 INVEST 3	**XG** [3,2] Wireless connection (4 -5G) COMPLEXITY 3 CRIT 3 INVEST 3	**MC** [2,8] Mechanical Engineering and construction COMPLEXITY 1 CRIT 3 INVEST 3	**AI** [3,2] Artificial intelligence COMPLEXITY 3 CRIT 3 INVEST 3
	El [2,6] Electronics and electronic equipment COMPLEXITY 2 CRIT 3 INVEST 2	**Au** [2,5] Automotive industry COMPLEXITY 2 CRIT 3 INVEST 1	**BD** [2,7] Big Data Storage and Analysis COMPLEXITY 2 CRIT 3 INVEST 3	**Me** [2,4] Micro-electronics COMPLEXITY 1 CRIT 3 INVEST 2	**DT** [2,5] Digital twins DIFFICULTY 2 CRIT 3 INVEST 3
	Em [2,6] Electromechanics and electrical equipment COMPLEXITY 2 CRIT 3 INVEST 2	**Av** [2,7] Aviation industry COMPLEXITY 3 CRIT 3 INVEST 1	**FE** [2,3] Efficient mineral resources extraction COMPLEXITY 1 CRIT 3 INVEST 1	**En** [2,3] Engine building COMPLEXITY 1 CRIT 2 INVEST 3	**ES** [2,4] Energy storage COMPLEXITY 2 CRIT 3 INVEST 2
PM [2,4] Materials production and processing COMPLEXITY 2 CRIT 2 INVEST 2	**PS** [2,4] Production of chemicals and solutions COMPLEXITY 2 CRIT 2 INVEST 2	**Rw** [2,5] Railway engineering COMPLEXITY 3 CRIT 2 INVEST 1	**NE** [2,5] Nuclear energy COMPLEXITY 2 CRIT 3 INVEST 1	**CT** [2,7] Cognitive technologies COMPLEXITY 3 CRIT 3 INVEST 1	**HE** [2,4] Hydrogen energy COMPLEXITY 2 CRIT 3 INVEST 2
	CF [2,4] Animal husbandry and breeding COMPLEXITY 2 CRIT 3 INVEST 3	**Sh** [2,2] Shipbuilding industry COMPLEXITY 3 CRIT 2 INVEST 1	**BC** [2,3] Distributed ledgers COMPLEXITY 3 CRIT 2 INVEST 2	**GS** [2,4] Geographic information systems COMPLEXITY 2 CRIT 3 INVEST 3	**HP** [2,3] Hydropower COMPLEXITY 1 CRIT 2 INVEST 2
PG [2,4] Crop production and selective breeding COMPLEXITY 2 CRIT 3 INVEST 3	**TP** [2,1] Heat and power engineering COMPLEXITY 2 CRIT 2 INVEST 2	**Ph** [2,3] Preventive and therapeutic drugs (including vaccines and antibiotics) COMPLEXITY 3 CRIT 2 INVEST 1	**Or** [2,0] Organic fertilization management COMPLEXITY 2 CRIT 1 INVEST 3	**So** [2,0] Soil technologies COMPLEXITY 2 CRIT 1 INVEST 3	**SE** [2,2] Solar energy COMPLEXITY 1 CRIT 3 INVEST 2
MR [2,3] Mining operations COMPLEXITY 2 CRIT 3 INVEST 2	**Fl** [2,4] Food processing COMPLEXITY 2 CRIT 3 INVEST 2	**MD** [2,2] Medical devices COMPLEXITY 2 CRIT 2 INVEST 3	**HF** [2,1] Healthy human nutrition solutions COMPLEXITY 3 CRIT 1 INVEST 2	**HH** [2,1] Human health technologies COMPLEXITY 2 CRIT 2 INVEST 2	

10

0

Mature technologies

2020 | 2023 | 2025 | 2028

2020-2025 | 2025-2030

TECHNOLOGICAL SOVEREIGNTY CHALLENGES

"PERIODIC TABLE" OF TECHNOLOGIES (2/2)

AGI ●●● [3,0] Artificial General Intelligence COMPLEXITY 3 CRIT 3 INVEST 3	**AR/VR** ● [2,3] Augmented and virtual reality COMPLEXITY 3 CRIT 1 INVEST 2	**QC** ● [2,6] Quantum communications systems COMPLEXITY 3 CRIT 3 INVEST 1	**CM** ● [2,4] Technologies for complexity management COMPLEXITY 3 CRIT 3 INVEST 1
Mn ● [2,4] Manufacturing organization DIFFICULTY 2 CRIT 3 INVEST 2	**Mt** ● [2,4] New materials and substances COMPLEXITY 2 CRIT 3 INVEST 2	**BS** ●●● [2,2] Managing natural and synthetic biosystems lifecycle COMPLEXITY 3 CRIT 2 INVEST 2	**CS** ● [2,4] Advanced communication systems (laser, etc.) COMPLEXITY 3 CRIT 3 INVEST 1
Sn ● [2,2] Sensorics COMPLEXITY 2 CRIT 2 INVEST 2	**Ge** ● [2,1] Genetic engineering technologies COMPLEXITY 3 CRIT 2 INVEST 1	**Sp** ● [2,3] Sattelite-based management COMPLEXITY 3 CRIT 3 INVEST 1	
DE ●●● [2,5] Distributed power generation COMPLEXITY 3 CRIT 2 INVEST 3	**Ch** ●● [2,0] Low-tonnage chemistry COMPLEXITY 2 CRIT 2 INVEST 2		
TE ● [2,0] Geothermal energy COMPLEXITY 1 CRIT 2 INVEST 2	**NT** ● [2,0] Neurotechnologies COMPLEXITY 3 CRIT 3 INVEST 1	**CH** ●● [2,1] Carbon and methane lifecycle management COMPLEXITY 3 CRIT 2 INVEST 1	**H_2O** ●● [2,0] Water lifecycle management COMPLEXITY 3 CRIT 2 INVEST 2
WE ● [2,2] Wind energy COMPLEXITY 1 CRIT 3 INVEST 2			**TF** ●● [2,0] Terraforming COMPLEXITY 3 CRIT 2 INVEST 2
	Mb ● [2,1] Production of preparations, including microbiological ones COMPLEXITY 3 CRIT 3 INVEST 2		

The period for achievement of technology maturity

2028 2030 2033 2035 2050

2025-2030 2030-2035 Maturity period 2035-2050

Example of a cell of a "periodic table" of technologies

Assessment of "valence" (K1) of technology from 0 to 3 for placement in the table of technologies along the "Y" axis

AI technology is a high-valent one and has more than 20 specialized applications in various industries such as: agriculture, medicine, power grid management, etc. It is one of the most end-to-end technologies today

Integral assessment of technology sovereignty calculated by the formula:

TS = K1×W1 + K2×W2 + K3×W3 + K4×W4 + K5×W5

TS (AI) = 3 × 0.3 + 3 × 0,2 + 4 × 0,2 + 3 × 0,2 + 3 × 0,1 = **[3.2]**

Conclusion: technology has a direct impact on sovereignty (TS >= 2)

Initials and name of the technology

AI - (artificial intelligence)

AI ●●● **[3.2]**

Artificial intelligence

COMPLEXITY 3
CRIT 3
INVEST 3

K1. Valence - 3

K3. Maturity - 4

Maturity score (K3) of the technology from 0 to 4 for placement in the table of technologies along the "X" axis

AI technology will reach the "technology productivity plateau" as early as 2020-2025 - its application in the market will become economically viable

Estimation of investment cycle duration (K5) of technology from 0 to 3

AI technology currently has an investment cycle duration of less than 5 years, which makes AI-enabled projects investment-attractive

Score in terms of complexity management (K2) 0 to 3

AI technology generates a large number of new systems and has a high internal dynamics, which leads to its self-complication. AI regulation needs to be done at an ethical level

Technology criticality score (K4) from 0 to 3

AI technology has a direct impact on critical infrastructure, as many digital and physical infrastructures are expected to be managed on the basis of AI-enabled systems in the future

The use of technology has an impact:

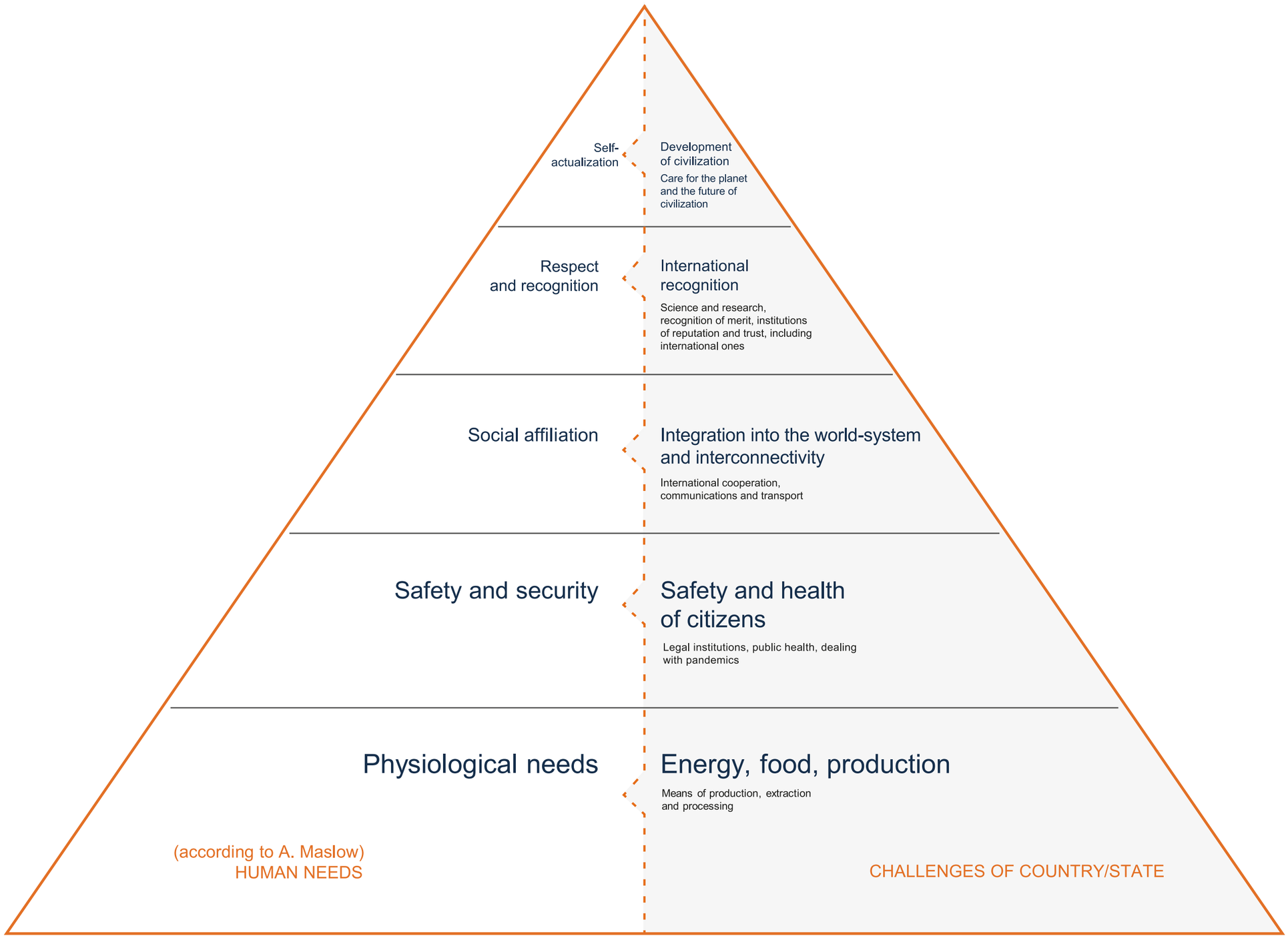
- ● on energy
- ● on space on
- ● person

The period for achievement of technology maturity:

- AI 2020-2025
- HE 2025-2030
- QC 2030-2035
- CS 2035-2050
- MR Mature technologies

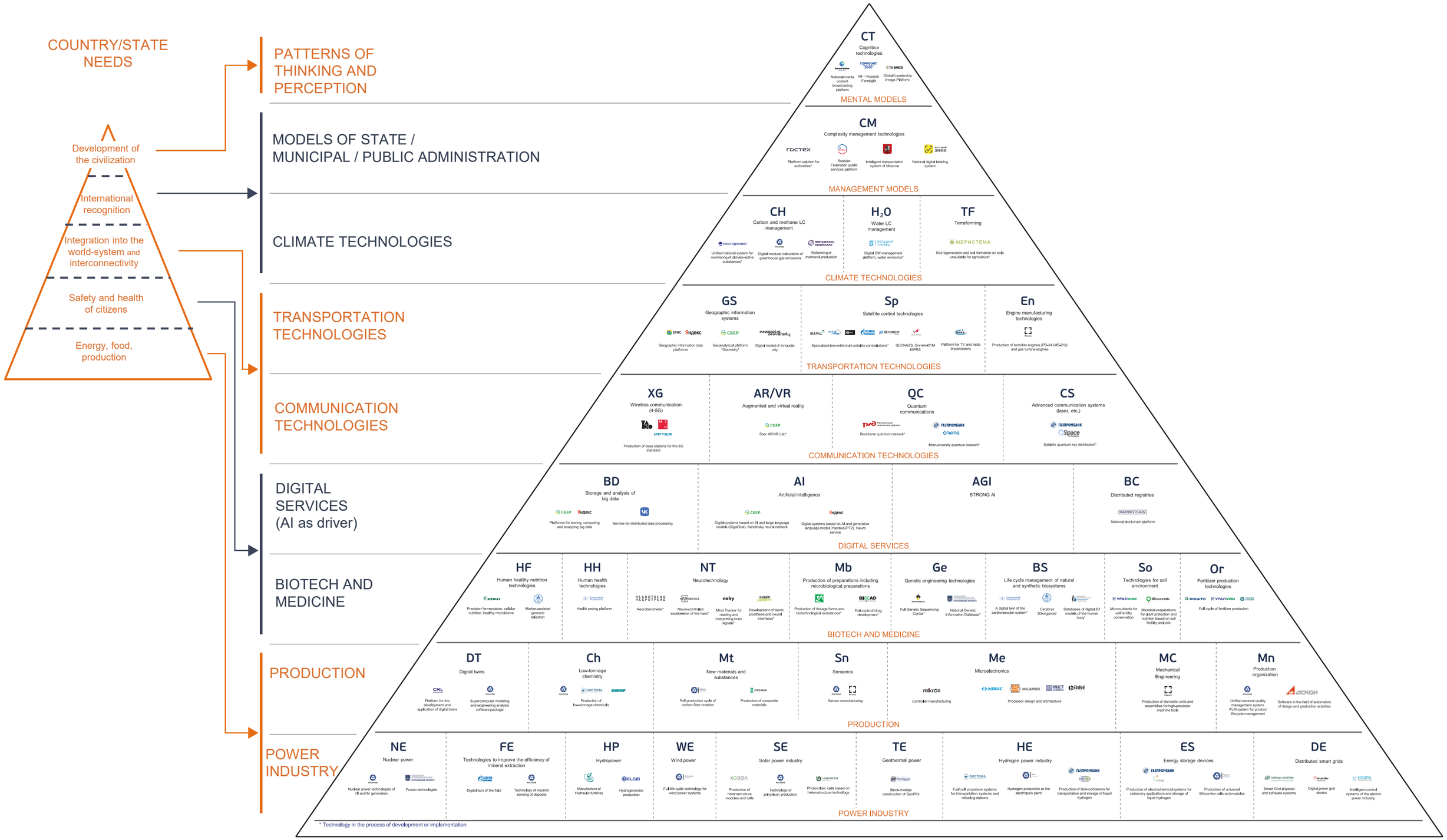
TECHNOLOGICAL SOVEREIGNTY MODEL

MASLOW'S HIERARCHY OF NEEDS AND THE GOALS OF THE STATE



TECHNOLOGICAL SOVEREIGNTY MODEL

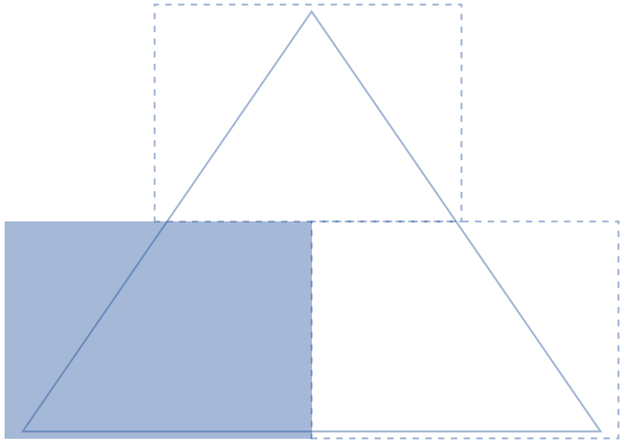
TECHNOLOGICAL SOVEREIGNTY MODEL: RUSSIAN COMPANIES AND PROJECTS (1/4)



* Technology in the process of development or implementation

TECHNOLOGICAL SOVEREIGNTY MODEL

TECHNOLOGICAL SOVEREIGNTY MODEL: RUSSIAN COMPANIES AND PROJECTS (2/4)



BD
Storage and analysis of big data

СБЕР Яндекс — Platforms for storing, computing and analyzing big data

VK — Service for distributed data processing

AI
Artificial intelligence

СБЕР — Digital systems based on AI and large language models (GigaChat). Kandinsky neural network

Яндекс — Digital systems based on AI and generative language model (YandexGPT2). Neuro service

DIGITAL SERVICES

HF
Human healthy nutrition technologies

ЭДЮКО — Precision fermentation, cellular nutrition, healthy microbiome

Marker-assisted genomic selection

HH
Human health technologies

Сеченовский Университет — Health saving platform

NT
Neurotechnology

NEUROTREND NEUROTRENO — Neurobarometer*

NEUROBOTICS — Neuro-controlled exoskeleton of the hand*

neiry — Mind Tracker for reading and interpreting brain signals*

Кибер Моторика — Development of bionic prosthesis and neural interfaces*

Mb
Production of preparations including microbiological preparations

Production of dosage forms and biotechnological substances*

BIOCAD Biotechnology Company — Full cycle of drug development*

BIOTECH AND MEDICINE

DT
Digital twins

CML CompMechLab — Platform for the development and application of digital twins

РОСАТОМ — Supercomputer modeling and engineering analysis software package

Ch
Low-tonnage chemistry

РОСАТОМ СИСТЕМА СИБУР — Production of low-tonnage chemicals

Mt
New materials and substances

КОМПОЗИТ РОСАТОМ — Full production cycle of carbon fiber creation

ИТЕКМА — Production of composite materials

Sn
Sensorics

РОСАТОМ Ростех — Sensor manufacturing

PRODUCTION

NE
Nuclear power

РОСАТОМ — Nuclear power technologies of III and IV generation

Национальный исследовательский центр «Курчатовский институт» — Fusion technologies

FE
Technologies to improve the efficiency of mineral extraction

Газпром недра — Digital twin of the field

РОСАТОМ — Technology of neutron sensing of deposits

HP
Hydropower

Hydraulic turbines — Manufacture of Hydraulic turbines

ELSIB — Hydrogenerator production

WE
Wind power

НОВАВИНД РОСАТОМ — Full life cycle technology for wind power systems

SE
Solar power industry

XGBEA — Production of heterostructure modules and cells

РОСАТОМ — Technology of polysilicon production

UNIGREEN ENERGY — Photovoltaic cells based on heterostructure technology

POWER INDUSTRY

* Technology in the process of development or implementation

TECHNOLOGICAL SOVEREIGNTY MODEL

TECHNOLOGICAL SOVEREIGNTY MODEL: RUSSIAN COMPANIES AND PROJECTS (3/4)

DIGITAL SERVICES

AGI

STRONG AI

BC

Distributed registries

MASTER CHAIN

National blockchain platform

BIOTECH AND MEDICINE

Ge

Genetic engineering technologies

РОСНЕФТЬ

Full Genetic Sequencing Center*

НАЦИОНАЛЬНЫЙ ИССЛЕДОВАТЕЛЬСКИЙ ЦЕНТР «КУРЧАТОВСКИЙ ИНСТИТУТ»

National Genetic Information Database*

BS

Life cycle management of natural and synthetic biosystems

Сеченовский Университет

A digital twin of the cardiovascular system*

Cerebral 3D-organoid

САМАРСКИЙ ГОСУДАРСТВЕННЫЙ МЕДИЦИНСКИЙ УНИВЕРСИТЕТ

Databases of digital 3D models of the human body*

So

Technologies for soil environment

УРАЛХИМ

Micronutrients for soil fertility conservation

Bionovatic

Microbial preparations for plant protection and nutrition based on soil fertility analysis

Or

Fertilizer production technologies

ФОСАГРО УРАЛХИМ ШЕЛКОВО АГРОХИМ

Full cycle of fertilizer production

PRODUCTION

Me

Microelectronics

mikron

Controller manufacturing

ЭЛВИС MILANDR МЦСТ ЭЛЬБРУС Baikal ELECTRONICS

Processor design and architecture

MC

Mechanical Engineering

Ростех

Production of domestic units and assemblies for high-precision machine tools

Mn

Production organization

РОСАТОМ

Unified sectoral quality management system. PLM system for product lifecycle management

АСКОН

Software in the field of automation of design and production activities

POWER INDUSTRY

TE

Geothermal power

РусГидро

Block-module construction of GeoPPs

HE

Hydrogen power industry

СИСТЕМА

Fuel cell propulsion systems for transportation systems and refueling stations

РАОС РОСАТОМ

Hydrogen production at the electrolysis plant

ГАЗПРОМБАНК НИТЕХ

Production of tank-containers for transportation and storage of liquid hydrogen

ES

Energy storage devices

ГАЗПРОМБАНК Inenergy

Production of electrochemical systems for stationary applications and storage of liquid hydrogen

РЭНЕРА РОСАТОМ

Production of universal lithium-ion cells and modules

DE

Distributed smart grids

ТАВРИДА ЭЛЕКТРИК

Smart Grid physical and software systems

plug&play ENGINEERING

Digital power grid district

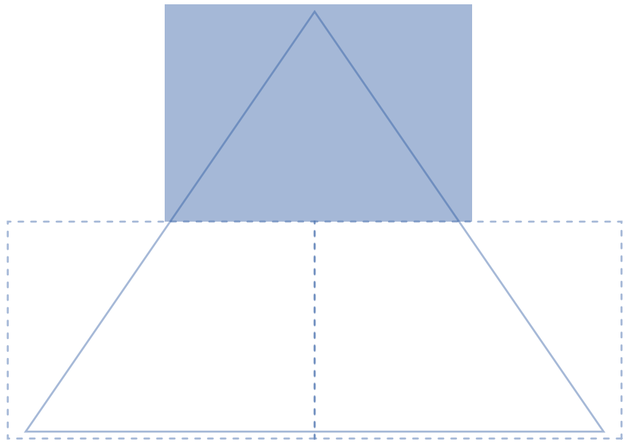
ИСКРА ТЕХНОЛОГИИ

Intelligent control systems of the electric power industry.

* Technology in the process of development or implementation

TECHNOLOGICAL SOVEREIGNTY MODEL

TECHNOLOGICAL SOVEREIGNTY MODEL: RUSSIAN COMPANIES AND PROJECTS (4/4)



CT
Cognitive technologies

ЭкстраСинема — National media content broadcasting platform

ГОРИЗОНТ 2040 — RF - Russian Foresight

TV BRICS — Global Leadership Image Platform

MENTAL MODELS

CM
Complexity management technologies

ГОСТЕХ — Platform solution for authorities*

гос услуги — Russian Federation public services platform

Intelligent transportation system of Moscow

ЧЕСТНЫЙ ЗНАК — National digital labeling system

MANAGEMENT MODELS

CH
Carbon and methane LC management

РОСГИДРОМЕТ — Unified national system for monitoring of climate-active substances*

РОСАТОМ — Digital modular calculation of greenhouse gas emissions

МЕТАФРАКС КЕМИКАЛС — Reforming of methanol production

H_2O
Water LC management

БОЛЬШАЯ ТРОЙКА — Digital SW management platform, water sensorics*

TF
Terraforming

МЕРИСТЕМА — Soil regeneration and soil formation on soils unsuitable for agriculture*

CLIMATE TECHNOLOGIES

GS
Geographic information systems

2ГИС Яндекс — Geographic information data platforms

СБЕР — Geoanalytical platform "Geometry"

INNOPOLIS UNIVERSITY — Digital model of Innopolis city

Sp
Satellite control technologies

BARL, MTA LABS, Lab, Газпром, sitronics group, РОСКОСМОС — Specialized low-orbit multi-satellite constellations*

GLONASS. Gonets-D1M ISPRS

RSCC — Platform for TV and radio broadcasters

En
Engine manufacturing technologies

Ростех — Production of turbofan engines (PD-14 (MS-21)) and gas turbine engines

TRANSPORTATION TECHNOLOGIES

XG
Wireless communication (4-5G)

Yadro, МТС, ИРТЕЯ — Production of base stations for the 5G standard

AR/VR
Augmented and virtual reality

СБЕР — Sber AR/VR Lab*

QC
Quantum communications

РЖД Российские железные дороги — Backbone quantum network*

ГАЗПРОМБАНК, QRATE — Interuniversity quantum network*

CS
Advanced communication systems (laser, etc.)

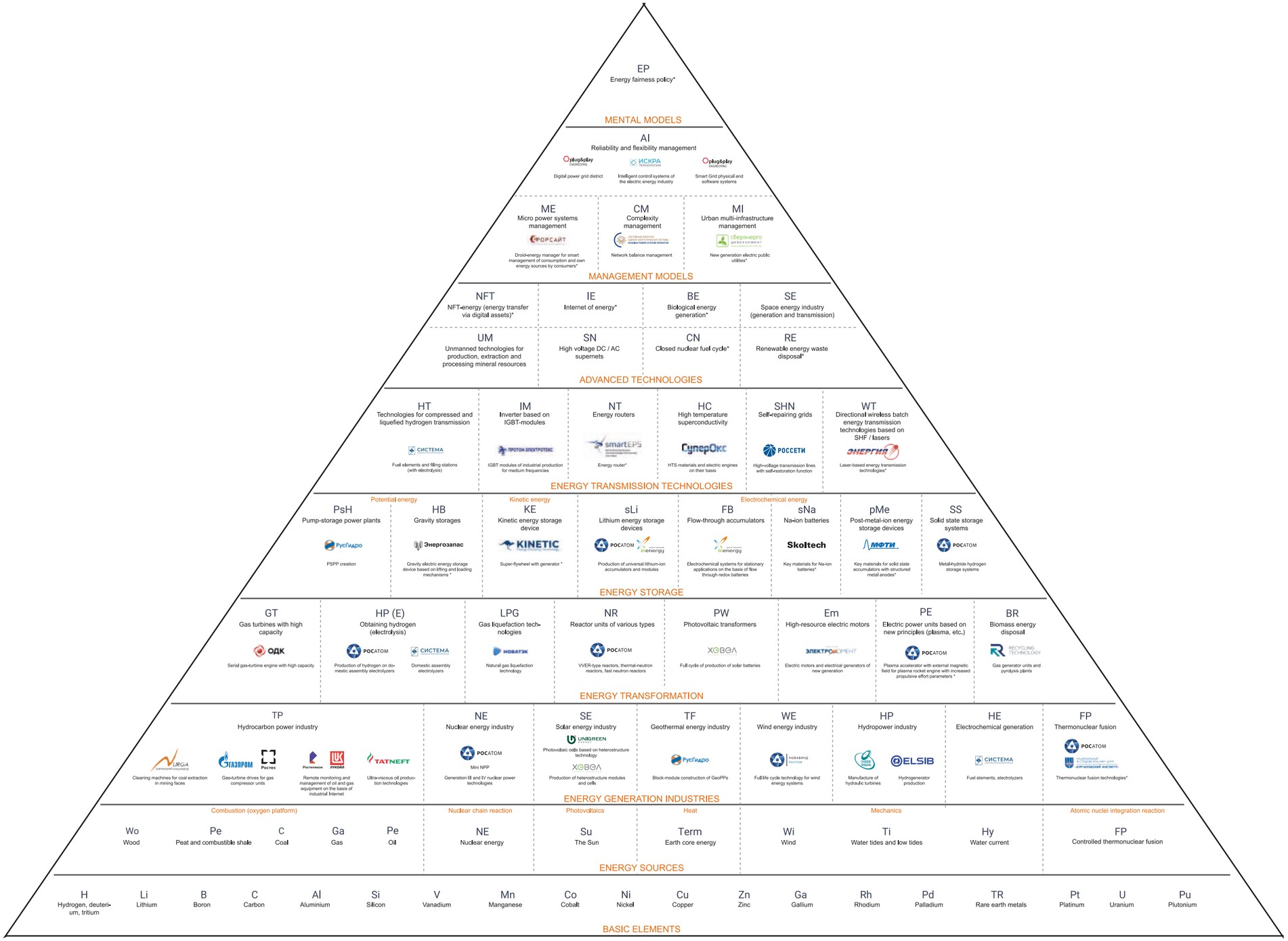
ГАЗПРОМБАНК, QSpace Technologies — Satellite quantum key distribution*

COMMUNICATION TECHNOLOGIES

* Technology in the process of development or implementation

TECHNOLOGICAL SOVEREIGNTY MODEL

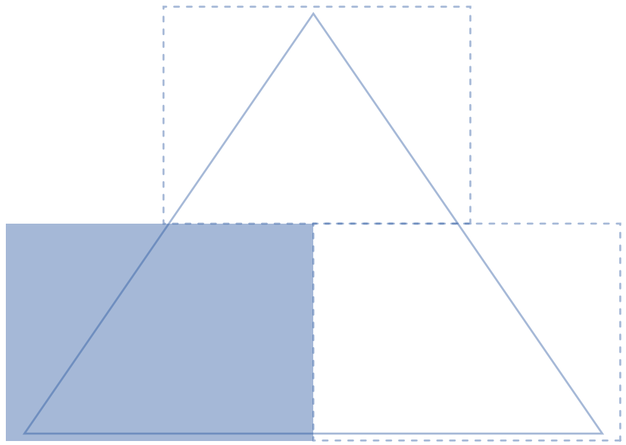
ENERGY (1/4)



* Technology in the process of development or implementation

TECHNOLOGICAL SOVEREIGNTY MODEL

ENERGY (2/4)



ENERGY STORAGE

Potential energy

PsH — Pump-storage power plants
РусГидро
PSPP creation

HB — Gravity storages
Энергозапас
Gravity electric energy storage device based on lifting and loading mechanisms *

Kinetic energy

KE — Kinetic energy storage device
KINETIC Energy Efficiency Technology
Super-flywheel with generator *

sLi — Lithium energy storage devices
РОСАТОМ, группа компаний inenergy
Production of universal lithium-ion accumulators and modules

ENERGY TRANSFORMATION

GT — Gas turbines with high capacity
ОДК
Serial gas-turbine engine with high capacity

HP (E) — Obtaining hydrogen (electrolysis)
РОСАТОМ
Production of hydrogen on domestic assembly electrolyzers

СИСТЕМА
Domestic assembly electrolyzers

LPG — Gas liquefaction technologies
НОВАТЭК
Natural gas liquefaction technology

NR — Reactor units of various types
РОСАТОМ
VVER-type reactors, thermal-neutron reactors, fast neutron reactors

ENERGY GENERATION INDUSTRIES

TP — Hydrocarbon power industry

URGA Юргинский машзавод
Cleaning machines for coal extraction in mining faces

Газпром, Ростех
Gas-turbine drives for gas compressor units

Ростелеком, ЛУКОЙЛ
Remote monitoring and management of oil and gas equipment on the basis of industrial Internet

TATNEFT
Ultra-viscous oil production technologies

NE — Nuclear energy industry
РОСАТОМ
Mini NPP
Generation III and IV nuclear power technologies

SE — Solar energy industry
UNIGREEN ENERGY
Photovoltaic cells based on heterostructure technology

ХЕВЕА
Production of heterostructure modules and cells

ENERGY SOURCES

Combustion (oxygen platform)

Wo — Wood
Pe — Peat and combustible shale
C — Coal
Ga — Gas
Pe — Oil

Nuclear chain reaction

NE — Nuclear energy

Photovoltaics

Su — The Sun

BASIC ELEMENTS

H — Hydrogen, deuterium, tritium
Li — Lithium
B — Boron
C — Carbon
Al — Aluminium
Si — Silicon
V — Vanadium
Mn — Manganese
Co — Cobalt
Ni — Nickel

* Technology in the process of development or implementation

TECHNOLOGICAL SOVEREIGNTY MODEL

ENERGY (3/4)

ENERGY STORAGE

Electrochemical energy

FB — Flow-through accumulators
Electrochemical systems for stationary applications on the basis of flow through redox batteries

sNa — Na-ion batteries
Key materials for Na-ion batteries*

pMe — Post-metal-ion energy storage devices
Key materials for solid state accumulators with structured metal anodes*

SS — Solid state storage systems
Metal-hydride hydrogen storage systems

ENERGY TRANSFORMATION

PW — Photovoltaic transformers
Full cycle of production of solar batteries

Em — High-resource electric motors
Electric motors and electrical generators of new generation

PE — Electric power units based on new principles (plasma, etc.)
Plasma accelerator with external magnetic field for plasma rocket engine with increased propulsive effort parameters *

BR — Biomass energy disposal
Gas generator units and pyrolysis plants

ENERGY GENERATION INDUSTRIES

TF — Geothermal energy industry
Block-module construction of GeoPPs

WE — Wind energy industry
Full life cycle technology for wind energy systems

HP — Hydropower industry
Manufacture of hydraulic turbines
Hydrogenerator production

HE — Electrochemical generation
Fuel elements, electrolyzers

FP — Thermonuclear fusion
Thermonuclear fusion technologies*

ENERGY SOURCES

Heat

Term — Earth core energy

Wi — Wind

Mechanics

Ti — Water tides and low tides

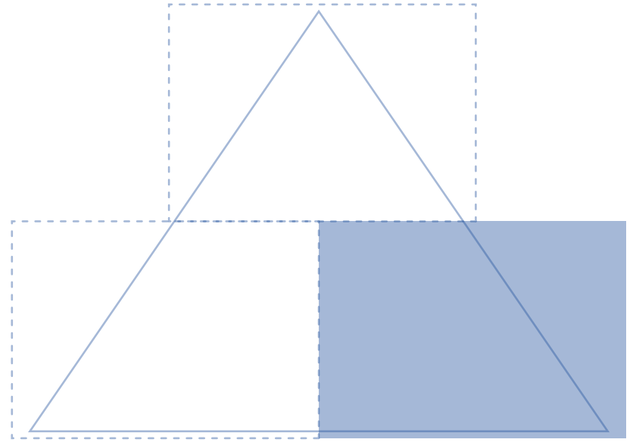
Hy — Water current

Atomic nuclei integration reaction

FP — Controlled thermonuclear fusion

BASIC ELEMENTS

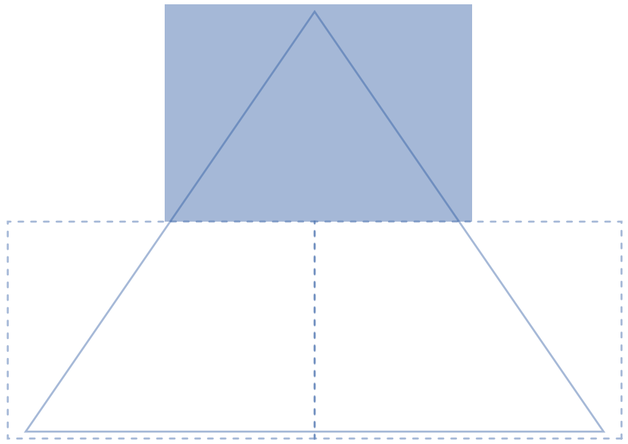
Cu — Copper
Zn — Zinc
Ga — Gallium
Rh — Rhodium
Pd — Palladium
TR — Rare earth metals
Pt — Platinum
U — Uranium
Pu — Plutonium



* Technology in the process of development or implementation

TECHNOLOGICAL SOVEREIGNTY MODEL

ENERGY (4/4)



EP
Energy fairness policy*

MENTAL MODELS

AI
Reliability and flexibility management

- plug&play ENGINEERING — Digital power grid district
- ИСКРА ТЕХНОЛОГИИ — Intelligent control systems of the electric energy industry
- plug&play ENGINEERING — Smart Grid physical and software systems

ME
Micro power systems management

- ФОРСАЙТ — Droid-energy manager for smart management of consumption and own energy sources by consumers*

CM
Complexity management

- СИСТЕМНЫЙ ОПЕРАТОР ЕДИНОЙ ЭНЕРГЕТИЧЕСКОЙ СИСТЕМЫ RUSSIAN POWER SYSTEM OPERATOR — Network balance management

MI
Urban multi-infrastructure management

- сберэнерго девелопмент — New generation electric public utilities*

MANAGEMENT MODELS

NFT
NFT-energy (energy transfer via digital assets)*

IE
Internet of energy*

BE
Biological energy generation*

SE
Space energy industry (generation and transmission)

UM
Unmanned technologies for production, extraction and processing mineral resources

SN
High voltage DC / AC supernets

CN
Closed nuclear fuel cycle*

RE
Renewable energy waste disposal*

ADVANCED TECHNOLOGIES

HT
Technologies for compressed and liquefied hydrogen transmission

- СИСТЕМА — Fuel elements and filling stations (with electrolysis)

IM
Inverter based on IGBT-modules

- ПРОТОН-ЭЛЕКТРОТЕКС — IGBT modules of industrial production for medium frequencies

NT
Energy routers

- smartEPS интеллектуальные электроэнергетические системы — Energy router*

HC
High temperature superconductivity

- СуперОкс — HTS materials and electric engines on their basis

SHN
Self-repairing grids

- РОССЕТИ — High-voltage transmission lines with self-restoration function

WT
Directional wireless batch energy transmission technologies based on SHF / lasers

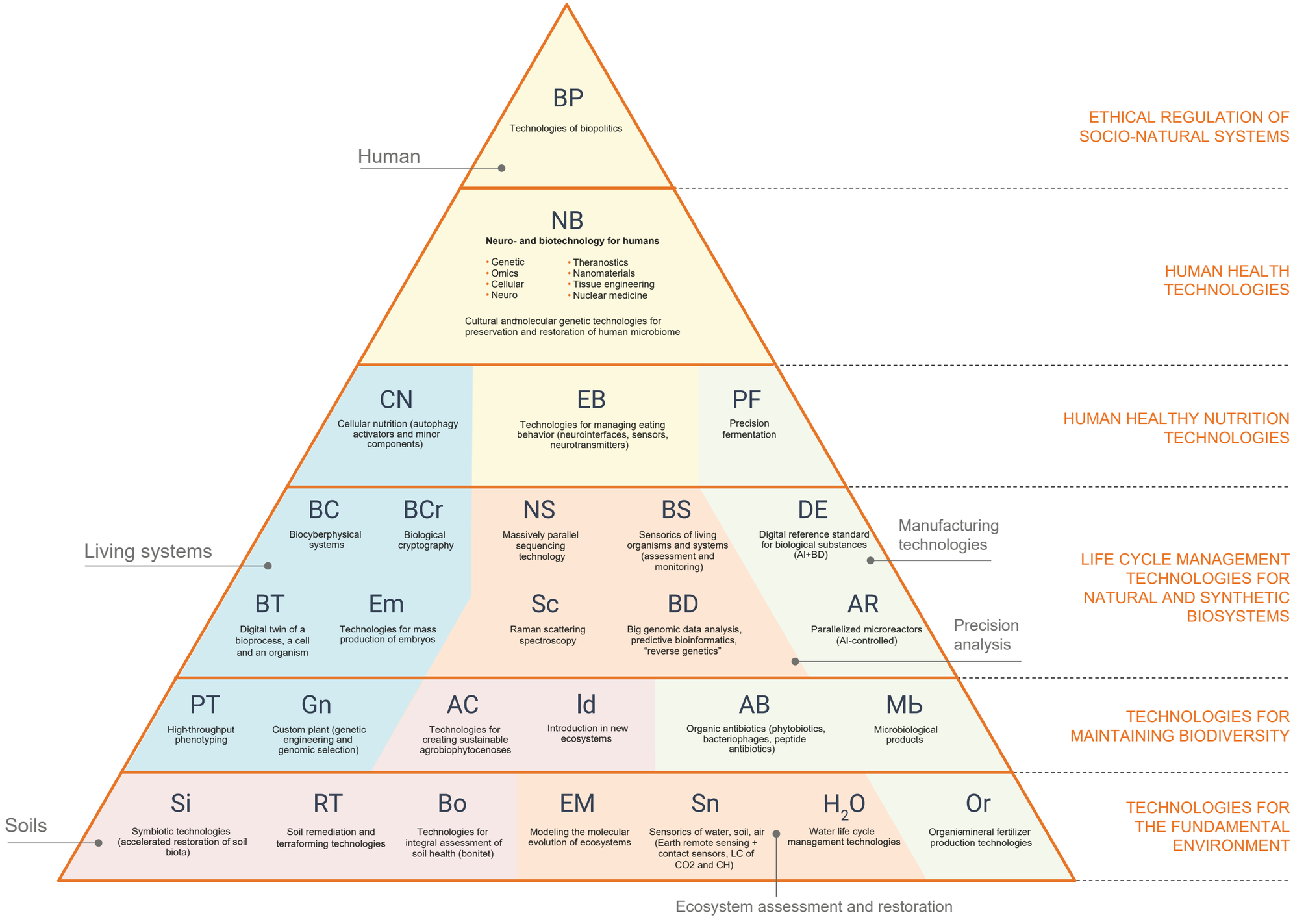
- ЭНЕРГИЯ — Laser-based energy transmission technologies*

ENERGY TRANSMISSION TECHNOLOGIES

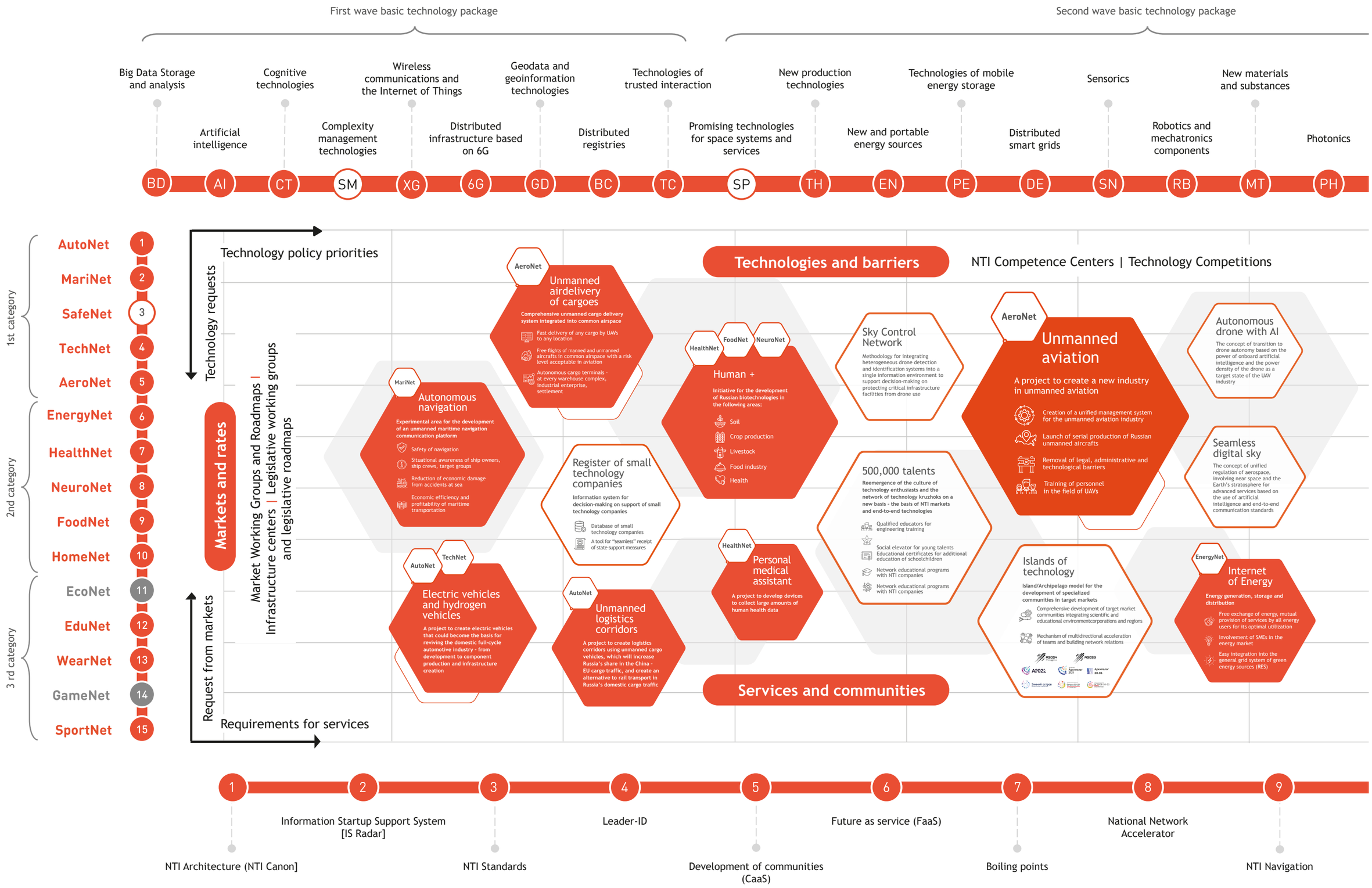
* Technology in the process of development or implementation

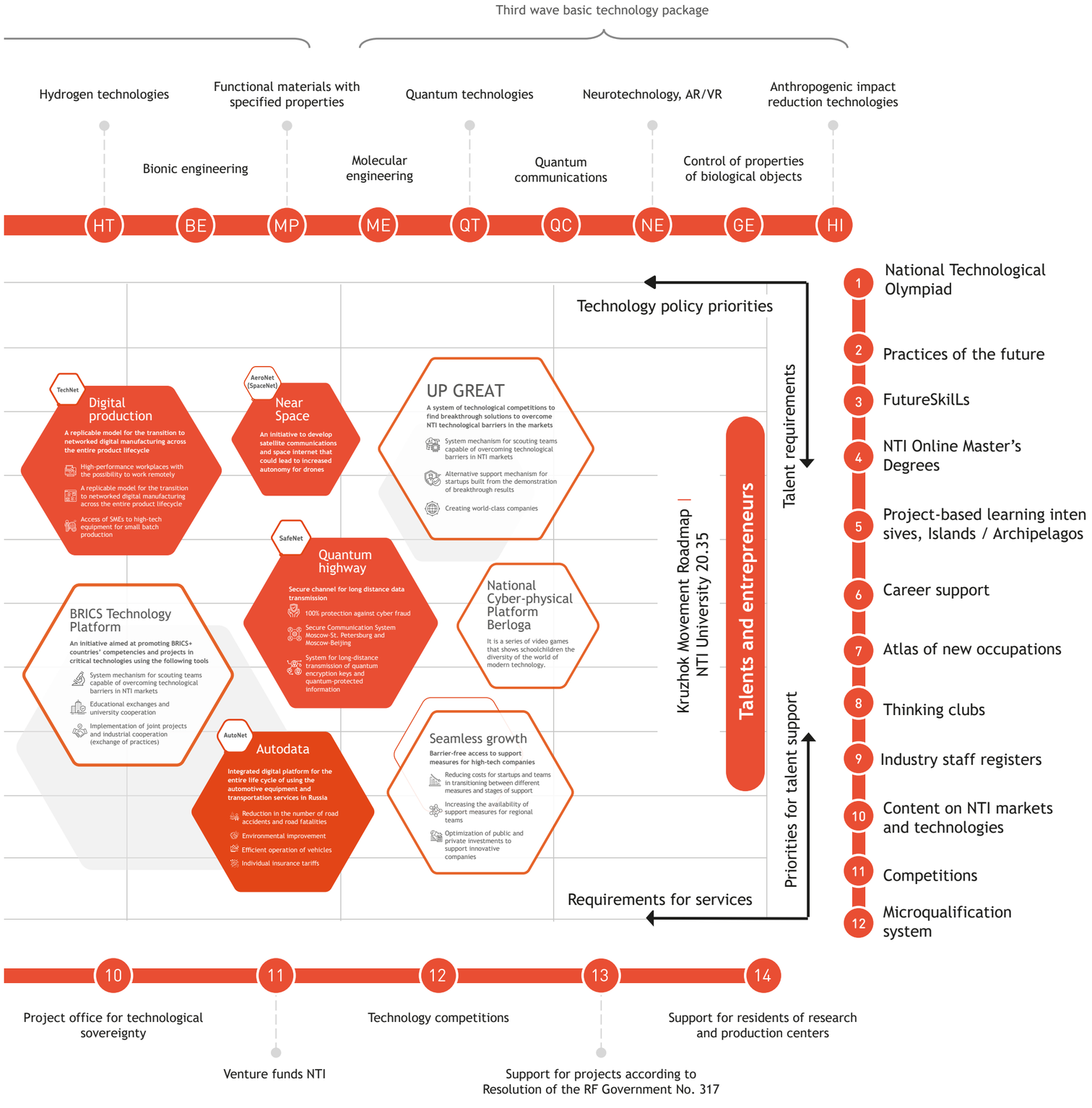
TECHNOLOGICAL SOVEREIGNTY MODEL

BIOTECHNOLOGY



MATRIX NTI


First wave basic technology package
Second wave basic technology package
Big Data Storage and analysis
Artificial intelligence
Cognitive technologies
Complexity management technologies
Wireless communications and the Internet of Things
Distributed infrastructure based on 6G
Geodata and geoinformation technologies
Distributed registries
Technologies of trusted interaction
Promising technologies for space systems and services
New production technologies
New and portable energy sources
Technologies of mobile energy storage
Distributed smart grids
Sensorics
Robotics and mechatronics components
New materials and substances
Photonics
BD AI CT SM XG 6G GD BC TC SP TH EN PE DE SN RB MT PH
1st category
2nd category
3 rd category
AutoNet 1
MariNet 2
SafeNet 3
TechNet 4
AeroNet 5
EnergyNet 6
HealthNet 7
NeuroNet 8
FoodNet 9
HomeNet 10
EcoNet 11
EduNet 12
WearNet 13
GameNet 14
SportNet 15
Technology policy priorities
Technology requests
Markets and rates
Market Working Groups and Roadmaps | Infrastructure centers | Legislative working groups and legislative roadmaps
Request from markets
Requirements for services
Technologies and barriers
NTI Competence Centers | Technology Competitions
Services and communities
AeroNet
Unmanned airdelivery of cargoes
Comprehensive unmanned cargo delivery system integrated into common airspace
Fast delivery of any cargo by UAVs to any location
Free flights of manned and unmanned aircrafts in common airspace with a risk level acceptable in aviation
Autonomous cargo terminals - at every warehouse complex, industrial enterprise, settlement
MariNet
Autonomous navigation
Experimental area for the development of an unmanned maritime navigation communication platform
Safety of navigation
Situational awareness of ship owners, ship crews, target groups
Reduction of economic damage from accidents at sea
Economic efficiency and profitability of maritime transportation
Register of small technology companies
Information system for decision-making on support of small technology companies
Database of small technology companies
A tool for "seamless" receipt of state support measures
AutoNet
TechNet
Electric vehicles and hydrogen vehicles
A project to create electric vehicles that could become the basis for reviving the domestic full-cycle automotive industry - from development to component production and infrastructure creation
AutoNet
Unmanned logistics corridors
A project to create logistics corridors using unmanned cargo vehicles, which will increase Russia's share in the China - EU cargo traffic, and create an alternative to rail transport in Russia's domestic cargo traffic
HealthNet
FoodNet
NeuroNet
Human +
Initiative for the development of Russian biotechnologies in the following areas:
Soil
Crop production
Livestock
Food industry
Health
HealthNet
Personal medical assistant
A project to develop devices to collect large amounts of human health data
Sky Control Network
Methodology for integrating heterogeneous drone detection and identification systems into a single information environment to support decision-making on protecting critical infrastructure facilities from drone use
500,000 talents
Reemergence of the culture of technology enthusiasts and the network of technology kruzhoks on a new basis - the basis of NTI markets and end-to-end technologies
Qualified educators for engineering training
Social elevator for young talents Educational certificates for additional education of schoolchildren
Network educational programs with NTI companies
Network educational programs with NTI companies
AeroNet
Unmanned aviation
A project to create a new industry in unmanned aviation
Creation of a unified management system for the unmanned aviation industry
Launch of serial production of Russian unmanned aircrafts
Removal of legal, administrative and technological barriers
Training of personnel in the field of UAVs
Islands of technology
Island/Archipelago model for the development of specialized communities in target markets
Comprehensive development of target market communities integrating scientific and educational environmentcorporations and regions
Mechanism of multidirectional acceleration of teams and building network relations
Autonomous drone with AI
The concept of transition to drone autonomy based on the power of onboard artificial intelligence and the power density of the drone as a target state of the UAV industry
Seamless digital sky
The concept of unified regulation of aerospace, involving near space and the Earth's stratosphere for advanced services based on the use of artificial intelligence and end-to-end communication standards
EnergyNet
Internet of Energy
Energy generation, storage and distribution
Free exchange of energy, mutual provision of services by all energy users for its optimal utilization
Involvement of SMEs in the energy market
Easy integration into the general grid system of green energy sources (RES)
1 NTI Architecture (NTI Canon]
2 Information Startup Support System [IS Radar]
3 NTI Standards
4 Leader-ID
5 Development of communities (CaaS)
6 Future as service (FaaS)
7 Boiling points
8 National Network Accelerator
9 NTI Navigation



Legend:

X New markets

X Institutionalized direction of NTI implementation

X Proactive elaboration, search for sustain able formats

CAPITAL INTENSITY OF THE MARKET:

1st category - markets that require expensive infrastructure and high government involvement as a consequence;

2nd category - markets that require risk sharing with the business in order for it to grow;

3rd category - markets that require only a rapid response to regulatory changes.

A NEW ERA OF SKY EXPLORATION HAS BEGUN

2024 г.: **AIRPLANE IS A GUEST IN THE SKY**

~ 340K airplanes in operation worldwide

2030 г.: **DRONE IS A HOST IN THE SKY**

~ 50M drones will be engaged in the global economy

MANNED AVIATION

DRONEOSPHERE

I Era

The first human-operated flight

Monitoring and control is provided by the crew on board

1903

II Era

The emergence of jet aviation

Control on board and coordination is provided by Airtraffic controllers

1930s

III Era

Unmanned Aviation

External highly automated monitoring and control

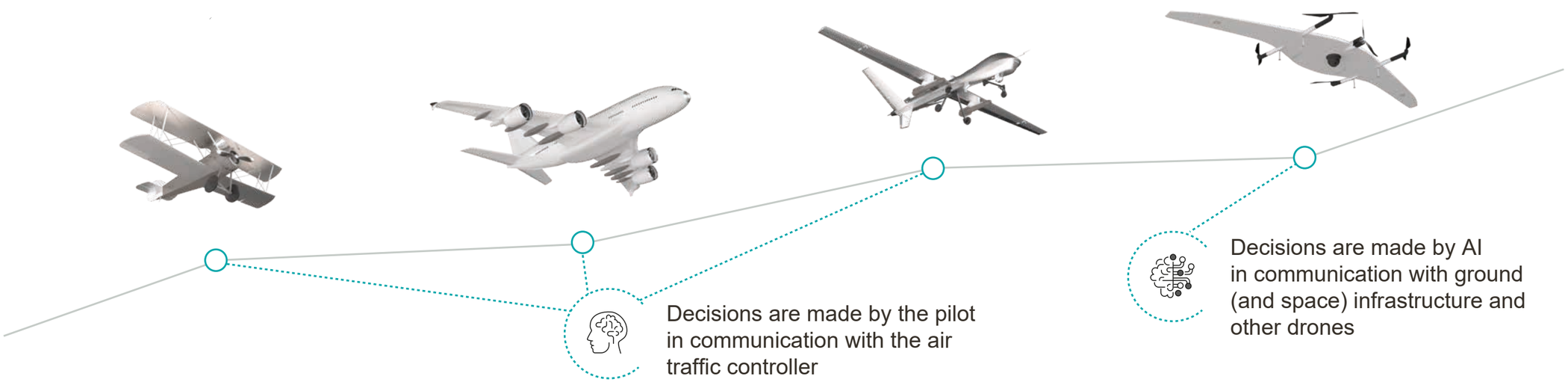
1980s

IV Era

Autonomous aviation

Control and monitoring without human intervention

2020s



Decisions are made by the pilot in communication with the air traffic controller

Decisions are made by AI in communication with ground (and space) infrastructure and other drones

MODELS FOR TECHNOLOGICAL SOVEREIGNTY:

DRONES AND NEAR SPACE (VER. 2.0)

MENTAL MODELS

UAV MARKET MODEL

COMMUNICATION AND CONTROL TECHNOLOGIES

DIGITAL SERVICES

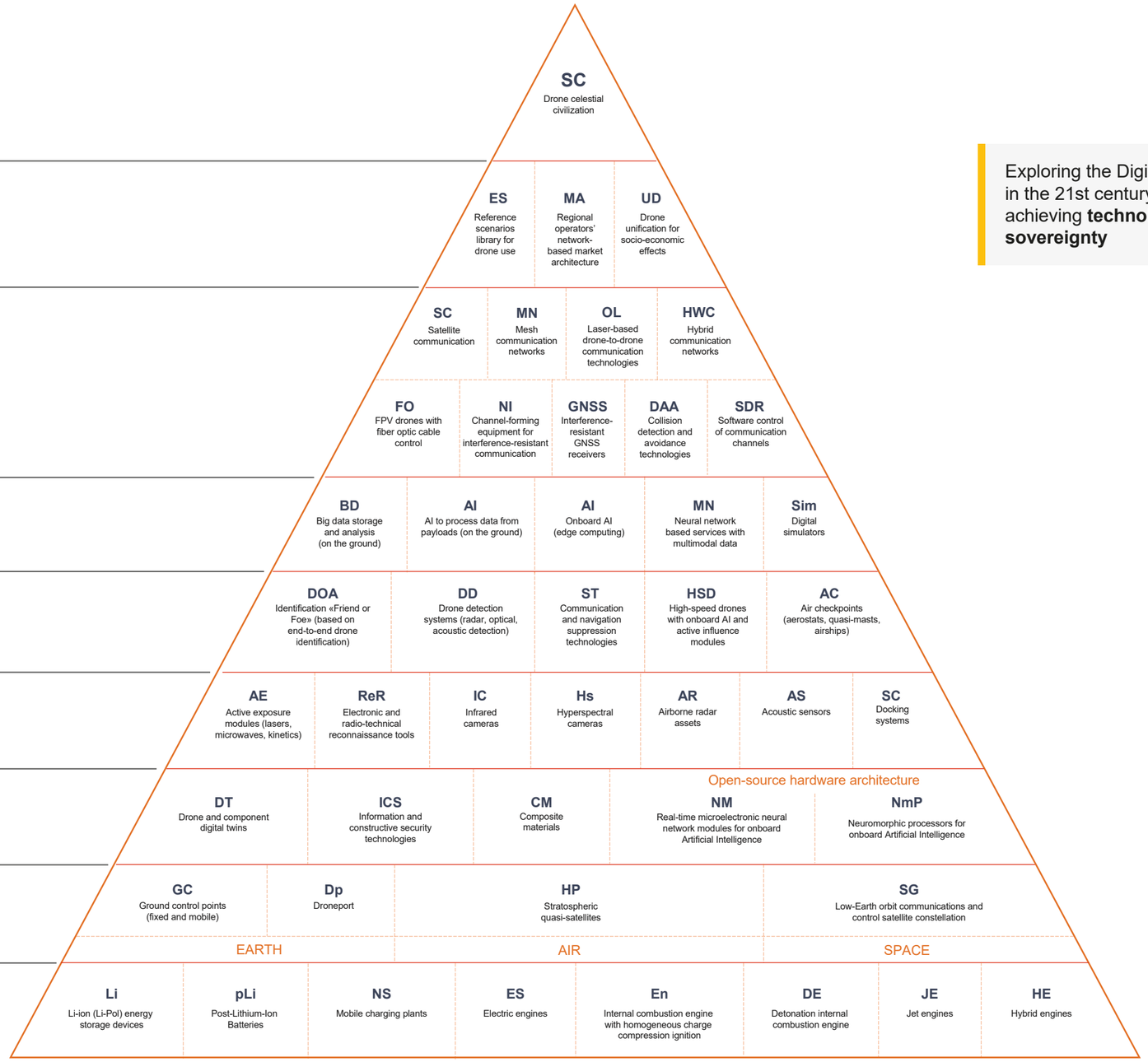
AIRSPACE SECURITY TECHNOLOGY

DRONE PAYLOADS

DRONES, SYSTEMS AND COMPONENTS MANUFACTURE

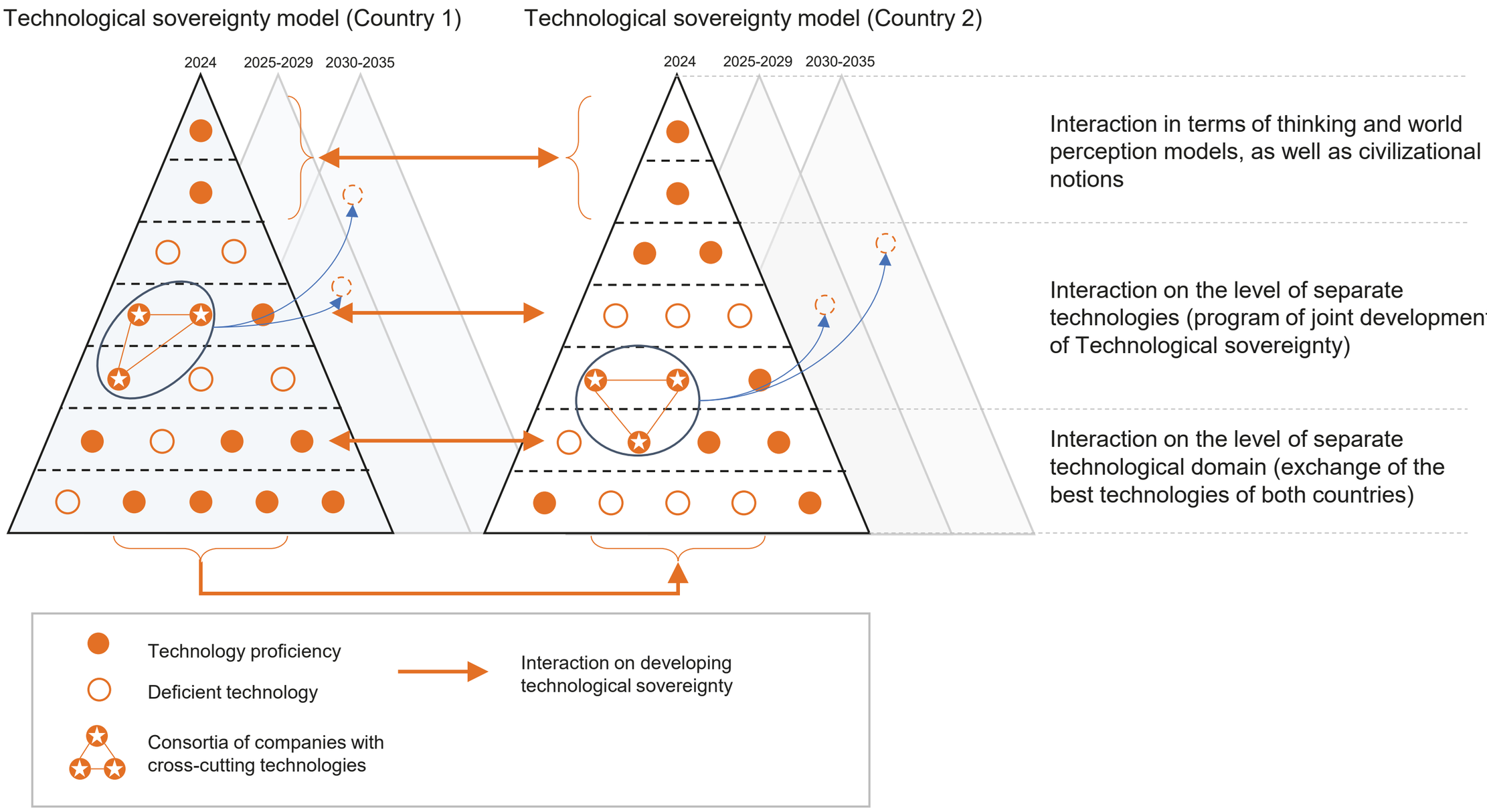
CONTROL INFRASTRUCTURE

DRONE POWER CAPACITY



Exploring the Digital Sky in the 21st century requires achieving **technological sovereignty**

INTERNATIONAL COOPERATION ON DEVELOPING TECHNOLOGICAL SOVEREIGNTY

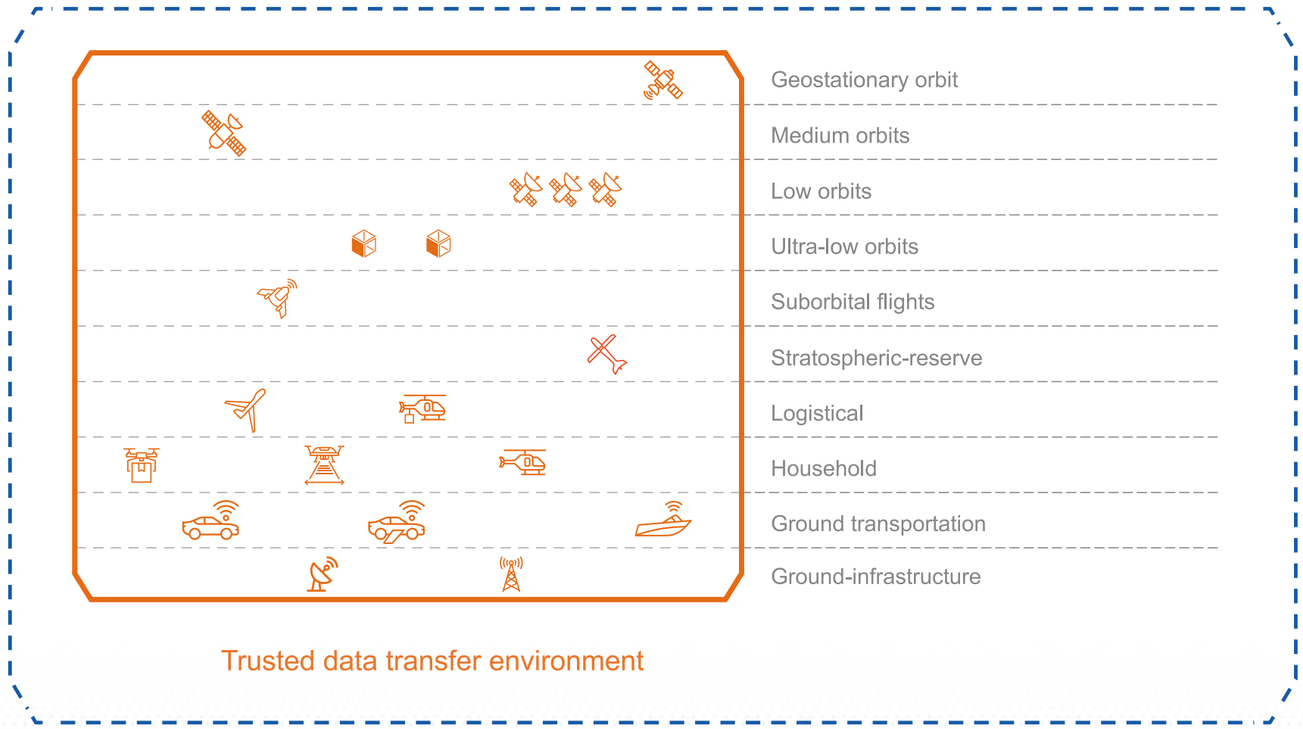


SKY ARCHITECTURE

SEAMLESS DIGITAL SKY

Combines the airspace and outer space layers into a single architecture requiring end-to-end regulation

Saturated with elements of critical information infrastructure (drones and satellites) integrated into commercial services, connected to hybrid communication and navigation networks



SINGLE LEGAL FIELD

- Critical information infrastructure protection
- Hybrid communication and navigation network
- Set of commercial services and services
- Flight safety
- Sky control technologies

It is necessary to create a new branch of law – "Digital Transport Law" to regulate relations in the information sphere on the basis of the digital twin of the sky and transport infrastructure

NEXT STEPS

- Production of prototypes, formation of preliminary national standards in key areas
- Inclusion of activities for the development of targeted space infrastructure for drones in the National UAV Project
- Launch of a series of R&D projects

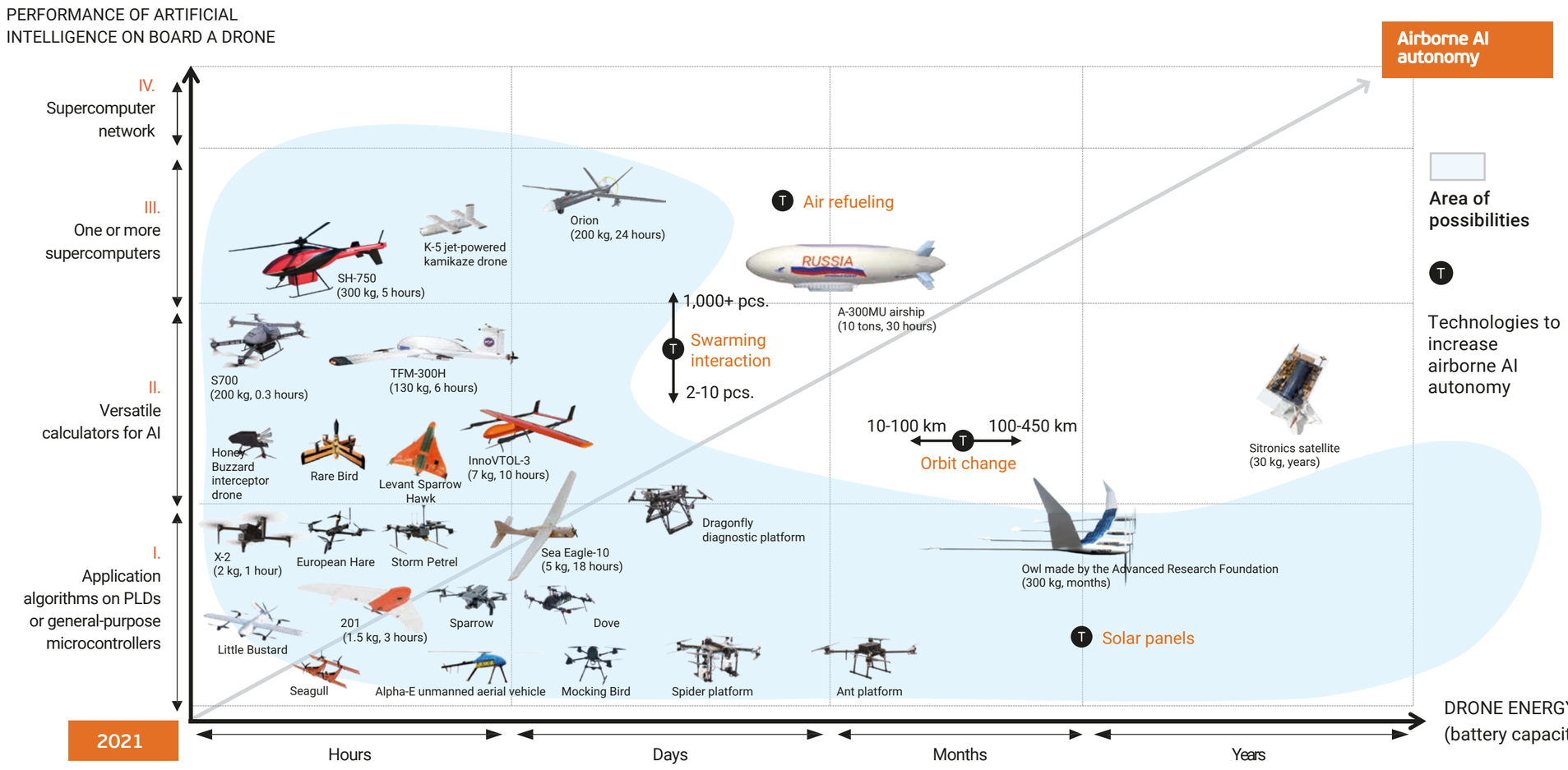
The concept was developed by GLONASS JSC, ANO NTI Platform and leading companies on instruction of First Deputy Prime Minister of the Russian Federation A.R. Belousov.

A DIGITAL SKY IS CREATED BY:

- End-to-end control, airspace and outer space management
- Introduction of a single information space for all drone use scenarios

SKY ARCHITECTURE

STRUGGLE FOR AUTONOMY



Most of modern Russian drones have flight durations ranging from a few tens of minutes to a few hours and use PLDs[1] and non-sovereign solutions to implement onboard algorithms.

Taking into account the geography of Russia, it is advisable to utilize available resources and technologies when developing the droneosphere.

Energy storage capacity

To achieve a flight duration of up to 24 hours with chemical fuels, the bet could be on sequential hybrid power systems and ICEs [2]

A related solution is to develop highly efficient aviation electric motors and batteries.

Onboard AI performance

It is advisable to bet on:

- heterogeneous, hybrid computing modules based on a Russian general-purpose processor combined with a specialized AI chip
- low-tech solutions in onboard computing for parity with alternative AI systems on high-performance versatile computing devices

[1] Programmable logic device (PLD)

[2] Internal combustion engine (ICE)

THE ARCHIPELAGO 2025

TESTBED FOR THE SHAPING JOINT VISION AND HORIZON

THE ARCHIPELAGO

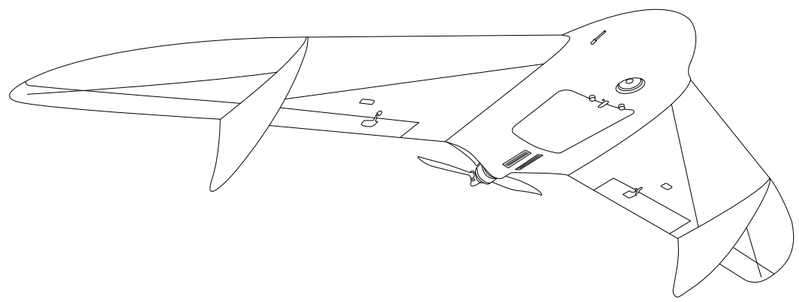
An annual experiential intensive for launching projects in new markets and industries that brings together representatives of technology teams, scientific institutions, universities, businesses and authorities.

Project developers get the opportunity to present their ideas, exchange experience with colleagues and find investors and partners.

International Archipelago is tentatively scheduled for 21-27 July, 2025 in Moscow

Participants (international teams):

- Engineers (onboard AI, drones, satellites, electric motors, mobile sources of energy)
- Regulator representatives (end-to-end regulation, future markets)
- Representatives of development institutions (to create Joint Vision and directions of technological partnerships)



1. Shaping Joint vision. Future of the droneosphere

The International Foresight for the exploration of Near Space and a seamless digital sky and the shaping of a joint vision of the sky exploration in the 21st century

2. Accelerating bi- and multilateral projects in the field of drones

- Low Earth Orbit satellite constellations
- Artificial intelligence
- Mobile sources of energy
- Air, land, sea drones
- New materials

3. Designing technology partnerships in the Shared Sovereignty model

- Shaping joint approach to the technological infrastructure setting for the implementation of export consortium projects
- The transition from the product export model to the model of joint technological development
- Countries dronification strategies

Tree steps to participate in The Archipelago 2025

1. Send a request with list of participants (email to: y.yakubova@nti.work)
2. Keep in contact with the organizers to get registered
3. Participate offline in Moscow

Infographics National Technology Initiative

Platform for Sovereign Technological Development

NATIONAL CYBERPHYSICAL PLATFORM

A future world inhabited by good-natured bears who study and apply high technology

A set of mobile and computer games, as well as real-world activities that allow you to "powerlevel" your character

Involving open events for schoolchildren: games, phygital-activities and workshops

New content of technology study groups, annual calendar of events

Download the game Berloga (Den): Apiary protection

RuStore 6+

Download the game Berloga: Academy

RuStore 6+

Users aged 6-12 years

The simplest games within the NPC "Berloga" (bea's rden) with a linear plot and quest tasks

Objective:

Familiarization with the setting, basic tools in mini-games, participation in children's activities

Users aged 12-15 years

Games within the framework of NPC "Berloga" with non-linear plot, programming and construction elements

Objective:

Character development in the "Berloga" setting, study, development and application of programming and construction skills learning, development and application of programming and design skills, participation in the National Technological Olympiad (NTO) and other engineering competitions and contests

Users 15+ years old

Creating your own games in the NPC "Berloga", organizing and conducting events and engineering competitions

Objective:

Applying programming and design skills in practice

> 24,000 users

downloaded 2 first Russian games "Berloga": "Apiary Defense" and "Academy" in 2023

> 5,500 schoolchildren

in 2023 participated in > 90 technological circles in the pilot region - Bashkortostan

> 14,000 guests

visited the “Berloga” grounds at the first international multisport tournament "Games of the Future" in Kazan in 2024

Programming in the “Berloga” platform

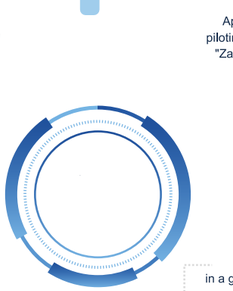
The graphical programming language in the “Berloga” games

Advanced Hierarchical State Machines (UML 2.0 Statecharts)

NATIONAL CYBERPHYSICAL PLATFORM

berloga

VR-lab STEM



Programmer

Results of the big data hackathon

Language mastery Python

PROFESSIONAL ACHIEVEMENTS

GAME ACHIEVEMENTS

Successful programming in games

Bioengineer

Working with the neuro lab

VR-lab chemistry

Results of the big data hackathon

Created a space farm simulator based on the game designer

Beekeeper

Apply drone piloting skills in "Zarnitsa 2.0"

Save the planet from cyberos

Creator

Created 3d models of scenes for the "Berloga" games

Won a game story contest

Created his own mobile game for the "Berloga"

Improved the look of my character in the game and my home location

Designer

Construction in a game simulator

Asse mbling and piloting the copter

Winning the engineering competitions

Outstanding results in games for the constructor

Pioneer

Participated in the expedition "Rediscovering Russia"

organized his own experiment on the ISS

Explored new worlds

Created his exploratory expedition in the "Berloga" game builder

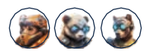
Skills

- professional
- gaming

Accomplishments

- professional
- gaming

Crew for the game:



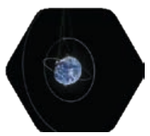
The game "Berloga" ("Den"): Protecting the apiary."

Playgrounds (circles) in Bashkiria

Network of circles

Game "Berloga: Academy."

Live games



Online simulator "Orbit."

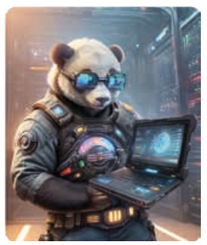
NATIONAL CYBERPHYSICAL PLATFORM

Beekeepers

With efficiently recycled energy, any problem can be solved.
Therefore, beekeepers are tirelessly expanding their apiaries to harvest high-energy honey.
Their golden armor protects them from the stings of huge, over a meter long, worker bees. Beekeepers are attentive and always mindful of safety.

Constructors

Talented mechanics and engineers from “Berloga” have woven the planet with a network of autonomous transportation routes, created hundreds of different kinds of helper drones and giant apiaries. The bears lie quietly in their winter hibernation, knowing that any equipment is working perfectly.

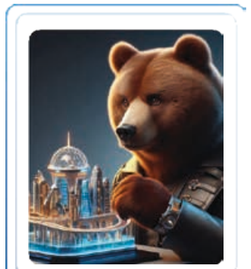


Programmers

The programmers in the “Berloga” have created "a digital hive, a unified data exchange system. Their dream is to digitize everything and automate everything to free their bear paws for the really important things.

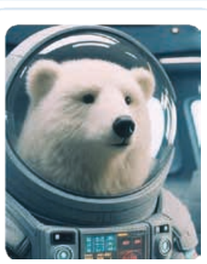
Bioengineers

Having defeated diseases, decoded the genome, and gotten rid of atavisms, bioengineers want to lead bears to a harmonious life on their home planet and in newly discovered worlds.
Neurotechnology, plant and bee genetics, smart agriculture - that's what bioengineers are interested in. The unsolved problem of civilization is the long winter hibernation.



Creators

"Civilization must free itself from primitive instincts and natural fetters. To transcend one's own limitations, one must go beyond the familiar and unwind the sleepy tranquility of the dens," say the Creators. At "Berloga", they do not only make art, but they are alsoengaged in urbanism, drone, apiary and bear den design, and game development.



Pioneers

Pioneers are always going forward - drifting on an ice floe, sinking to the bottom of the ocean, diving down mole holes and launching research equipment to new planets.
After all, the most interesting thing about a civilization is its frontier!

Phyjital activities in the world of play:

From the "Berloga" games schoolchildren get to face-to-face platforms, where they master UAV, AI, programming technologies, thanks to which they powerlevel their characters in the games and get knowledge and additional points for the USE in real life.

Immersion in the stories of the "Berloga" games

Earning in the game world

First engineering experience

Building a community of enthusiast

Connection with the study group themes

National
Technoløgy
Initiative

Download NTI infographics