

10 JRC PRIORITY NEXUS

ISSUES AND DESCRIPTORS

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JRC priority nexus reflect mid- and long term research priorities to underpin European policies. The list of issues and sub-issues provides direction and thematic focus for JRC's work and will guide its annual work programme. The JRC will however not fully address all research issues listed. The nexus document will be reviewed regularly to ensure its relevance to the evolving policy needs.

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1. Economy, finance & markets:

ISSUES	DESCRIPTORS
EMU and financial stability	<ul style="list-style-type: none"> → banking sector → excessive indebtedness and competitiveness → current account imbalances, international financial flows → shadow banking → financial markets → macroeconomic and fiscal surveillance → virtual currencies → stock market volatility → public investment and quality of public service provision → vulnerability to external shocks → understanding and measuring budget transfers across the EU → structural reforms
Single market and new business models	<ul style="list-style-type: none"> → intra EU trade including between EU regions → 'sharing' economy → digital market development → cross-border e-commerce → European standardisation
Economic and industrial development	<ul style="list-style-type: none"> → access to capital → prosumers → green and circular economy → knowledge economy → digital revolution and data explosion i.e. Internet of Things → world corporate R&D investors → growth of innovative enterprises → fragility of the global production systems → resilience of global value chain → competitiveness of EU industry in global value chains and linkages to regional ecosystems
Fair income distribution and beyond GDP	<ul style="list-style-type: none"> → equitable tax systems → efficiency of tax systems and regulatory burden → tax evasion and avoidance → integration of environmental degradation i.e. pricing and valuing scarce resources

	<ul style="list-style-type: none">→ demographic effects on economy→ growth and inequality→ distributional implications of finances→ infrastructure finance and investment→ pension sustainability→ measurement of resilience
Trade	<ul style="list-style-type: none">→ external macroeconomic imbalances & vulnerability to external shocks, policy coherence→ new ways of doing business and trade→ trade in services→ socio-economic and environmental implications of trade policy

2. Energy and transport:

ISSUES	DESCRIPTORS
<p>New and alternative energy sources, carriers and technologies for the decarbonisation of the energy supply</p>	<p>→ costs, benefits, progress and impacts (including environmental) of new energy sources (e.g. shale gas), renewables and energy technologies, including Carbon Capture Utilisation and Storage (CCS)</p>
<p>Energy transmission and distribution systems</p>	<p>→ energy systems dedicated to future electricity and CHP generation, including smart grids, smart meters, storage on all levels and decentralised energy management</p> <p>→ heating and cooling networks</p> <p>→ new energy & power storage systems, including batteries</p> <p>→ interoperability and interaction of systems including hybrid systems</p> <p>→ resilience of energy infrastructures and transmission systems</p> <p>→ consumer/prosumer behaviour and its opportunities for the flexibility and management of the decentralised system</p> <p>→ traceability and labelling of energy sources</p> <p>→ digitisation of the energy sector, including data-intensive systems for control, operational planning and management of multi-stakeholders' energy systems;</p> <p>→ cybersecurity, data privacy (incl. accessibility of data to service providers) and resilience of energy distribution system i.e. intelligent systems and smart grids</p> <p>→ governance and regulation of trans-national energy systems</p> <p>→ energy diplomacy regarding energy transmission systems, contributing to an energy independent Europe</p>
<p>Energy efficiency</p>	<p>→ supply and demand side of transport, energy, buildings (both embedded and operational energy), industry and products, including role of taxation, regulation and standards as a driver</p> <p>→ harmonisation of new energy saving technologies and devices, including labelling and phase-out schemes</p> <p>→ demand response, including opportunities for prosumers (DSO clients which produce and</p>

	consume energy).
Energy markets	<p>Internal energy market analysis:</p> <ul style="list-style-type: none"> → economy of energy production; subsidies and life cycle costs → EU strategic investments in E&T i.e. the measurement of the effects of investments and impact assessment → market architectures for high shares of renewables, and economic opportunities of energy (e.g. energy services, combined renewable and energy efficiency measures) <p>Global energy market:</p> <ul style="list-style-type: none"> → geopolitics of energy; global economic dynamics and implications for EU's energy and climate policy effectiveness; global energy and climate outlook; investments and finance → global governance of energy decarbonisation and climate change mitigation; analysis of efficient and equitable flexible mechanisms
Safety, waste management and decommissioning of energy installations	<ul style="list-style-type: none"> → design, operation and regulation of nuclear and non-nuclear energy installations → accident prevention and management, as well as remediation strategies → safety, waste management and decommissioning of current and new generation nuclear reactors and fuel cycles (by design, operation regulation)
Safeguards related to installations	<ul style="list-style-type: none"> → safeguards of nuclear materials and facilities → safeguards by design of future installations
Multi-modal transport systems	<ul style="list-style-type: none"> → safe, secure, sustainable, intelligent, integrated, connected and interoperable low carbon transport systems → intelligent transportation systems → E-mobility; clean (low carbon), accessible and safe new generation of vehicles → autonomous vehicles and navigation systems → Unmanned Aircraft Systems (incl. drones) → transport services and accessibility of prioritised areas (incl. for persons of reduced mobility) and urban mobility → consumer participation in transport system development → testing methodologies and pre-standardisation work for Heavy Duty Vehicle emissions, real driving emissions, low emission vehicle standards

	<ul style="list-style-type: none"> → measurement and analysis of transport R&I to shape transport policy → transport modelling
<p>Cross-cutting issues</p>	<ul style="list-style-type: none"> → assessment of and tools for national energy strategies in view of EU climate targets → global energy security of supply; energy and carbon diplomacy → social robustness and implications of current and future energy systems, energy vulnerability, affordability, energy access and energy poverty → future, long term forecasts for energy production and needs including urban and territorial planning → affordability, energy access and energy poverty → Covenant of Mayors and of regions → development and validation of harmonised, cost-effective, fit-for-purpose performance and safety standards for energy and transport technologies and systems → analysis of R&I projects and results for shaping Energy Union policies

3. Education, skills and employment:

ISSUES	DESCRIPTORS
Education	<ul style="list-style-type: none"> → equitable wider access to education and training (including spatial proximity) Innovation in education, transformation of education: <ul style="list-style-type: none"> → changing role of educators and learners → e-learning and new forms of education → life-long learning (developing competences to know, do, be, live together) → learning analytics → recognition and validation of non-formal and informal learning → education of multicultural groups → health literacy, green literacy, resilience → quality in education (teachers' and student' performance: infrastructures) → impact of education and training policies (infrastructure, training programs for teachers, adoption of learning tools) → education and social mobility (how to finance education and the role of the private sector) → drivers of the demand for education → returns to education and vocational training
Skills	<ul style="list-style-type: none"> → transversal skills, incl. digital skills, entrepreneurship, creativity → knowledge retention and transfer → impact of non-cognitive skills on labour market outcomes
Employment	<ul style="list-style-type: none"> → new forms of work and employment → high quality and sustainable employment addressing gender perspective → unemployment → mobility → use and potential of ICT for employability, social inclusion and social policy innovation → improving matching of demand and supply: design and impacts
Cross cutting issues:	<ul style="list-style-type: none"> → Human Capital development and implications → Human Capital, technology and productivity → education and skills for dealing with ageing

	→ vulnerable groups and their integration in education, society, labour markets (e.g. elderly, youth, gender, migrant background, socially marginalised groups)
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4. Food, nutrition and health:

ISSUES	DESCRIPTORS
<p>The food value chain</p>	<ul style="list-style-type: none"> → food fraud → food labelling and packaging → economic balance in the food chain including aspects on trade, fair benefits to smallholders → risks for smallholders and micro, small and medium size enterprises prior to investment in value-chain development → effects of subsidies on the market → new forms of retailing and distribution: how to guarantee quality of food using these systems → competitiveness of food and feed industries → use of new technologies for production of crops, livestock, nutraceuticals → impact of new food processing techniques on quality and safety → impact of new and novel food on the environment → food waste: including waste from food packaging → role of education on food, responsible food consumption
<p>Consumer safety</p>	<p>Food and Feed safety:</p> <ul style="list-style-type: none"> → tracking and controlling food and feed safety and quality → chemical pollution/ contamination → radionuclides in food and drinking water → endocrine disruptors in food → nutraceuticals and botanicals <p>Health hazards:</p> <ul style="list-style-type: none"> → hazards of chemical substances to health and environmental species, → alternative methods to animal testing → application of Adverse Outcome Pathways (AOP) approaches in safety assessment → Health/benefit assessment of nanomaterials → occupational health hazards → radiation protection <p>Consumer protection and choice</p> <ul style="list-style-type: none"> → consumer engagement → effective and intelligent consumer information

Impact of nutrition on health	<ul style="list-style-type: none"> → effects for health: diverging effects of food and nutrition on citizens/consumers → behavioural and environmental aspects of nutrition and health → personalised nutrition → obesity → organic food, ecological food, biodynamic food
Public health	<ul style="list-style-type: none"> → health promotion and disease prevention → health data management and patient registries. → health service management including the definition of good practices. → treatments: effective medicines including alternative and traditional medicines produced with minimized animal testing → self –diagnosis → fighting antibiotic resistance → access to healthcare services → new methods to improve health economic evaluation → health services for marginalised population → healthcare in the context of free movement
Health technologies	<ul style="list-style-type: none"> → health technology assessment → medical devices → cosmetics → eHealth services including telemedicine and tele-care with focus on active and healthy ageing → Improved prevention and health diagnostic tools → health information, data management, protection and privacy → personalised medicine → new technologies including gene/cell therapies, regenerative medicine, tissue engineering, bio-printing, new pharma and radiomedical applications

5. Environment, resource scarcity, climate change & sustainability:

ISSUES	DESCRIPTORS
<p>System understanding of resources and climate</p>	<ul style="list-style-type: none"> → planetary boundaries and their interconnections → global indicators, drivers and trends → global governance of natural resources → role of local solutions in tackling global problems
<p>Sustainable production and consumption and the circular economy</p>	<p>Sustainable agriculture</p> <ul style="list-style-type: none"> → sustainable intensification → precision farming → climate smart farming → other alternative production methods <p>Sustainable aquaculture</p> <p>Sustainable industry (including energy-intensive industries, mining, construction, and green chemistry):</p> <ul style="list-style-type: none"> → best available techniques, emerging techniques → alternative production technologies & their safety and life-cycle analysis <p>Sustainable consumption:</p> <ul style="list-style-type: none"> → market-based and voluntary instruments promoting the consumption of better environmental performing products → impact of consumption on the environment <p>Circular economy including:</p> <ul style="list-style-type: none"> → eco-innovation → product design → business models → consumption patterns → markets for secondary raw materials → role of innovation, industry and new technologies in sustainable solutions <p>Paradigm of economic growth and sustainability including alternative models</p>

<p>Resource management</p>	<ul style="list-style-type: none"> → scientific and technical inputs to CAP development: towards a land management approach → crop yield forecasts in EU and Neighbourhood countries → resource scarcity (land/soil, minerals, water, food, energy, forests, biomass, biodiversity) and economic competition → economy of natural resources including bioeconomy and critical raw materials → raw materials – stocks and flows → alternatives for scarce resources including new sources (e.g. from space) → resource conflicts (i.e. water, minerals, agriculture) → global resource use → sustainable management of renewable resources (including sustainable forest management, fisheries, soils, water, forests, and biodiversity) → global land use and vegetation → ecosystems and their services and natural capital accounting → oceans as a resource for energy, food production and minerals → mega cities and urbanisation including impact of urban sprawl on resources → role of education and social aspects
<p>Environment and resource quality</p>	<ul style="list-style-type: none"> → air, water, soil, forest: <ul style="list-style-type: none"> - assessment of quality, ecological status - pollution, including impacts of compounds on the environment → land degradation, desertification and deforestation
<p>Food security</p>	<ul style="list-style-type: none"> → food and nutrition security assessments → food accessibility and equity → monitoring of food security outside the EU - link to migration and to fairness and gender equality → impact of climate change on food and feed production and trade, including new pests and diseases → urban farming (including urbanisation versus food sustainability)
<p>Climate change</p>	<ul style="list-style-type: none"> → monitoring international climate agreements → analysis of adaptation and mitigation options

	<p>in different sectors(or policy areas)</p> <ul style="list-style-type: none">→ economics of climate change→ impacts of adaptation and mitigation on EU regions and cities
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6. People, governance in multicultural and networked societies:

ISSUES	DESCRIPTORS
New forms of participative governance	<ul style="list-style-type: none"> → citizen engagement and participation in the policy cycle and decision making i.e. on-line consultation, e-voting → Relation between governance, participation and democracy within and outside the EU and at global level → Mutual accountability and transparency → Plurality of participation (multi stakeholder fora) → digital citizenship → role and consequences of social media → role of education in shaping an informed society → behavioural drivers
Equity, inequality and fairness	<ul style="list-style-type: none"> → wealth and income inequality → tackling deprivation and exposure to risk → perception of fairness, impact of policies on fairness → gender dimension
Fight against poverty	<ul style="list-style-type: none"> → socially marginalised groups and inter-generational poverty, differentiating rural from urban poverty (insecurity, specific living conditions, human rights and dignity) → impact of scarcity on individual capacity and behaviour → social protection systems and measures to prevent extreme poverty, including reducing exposure and vulnerability to shocks and disasters → improving the impact and effectiveness of EU development cooperation
Public sector performance	

7. Civil security

ISSUES	DESCRIPTORS
Human Security	<ul style="list-style-type: none"> → early warning for conflicts and instability → prevention of conflicts/instability → improving delivery of humanitarian aid → comprehensive approach to fragility (linking relief, rehabilitation and development) → building resilience of affected populations and host communities → crisis situations, food security and resilience
Disaster risk management	<ul style="list-style-type: none"> → prevention, preparedness and response to disasters → preparedness, detection and response to emergencies (including radiological, chemical and biological threats, pandemics and epidemics) → new models of civil protection; integrating the citizen → assessment of new security and crisis management technologies
Fight against crime and terrorism	<ul style="list-style-type: none"> → combatting illicit trafficking (e.g. human, drugs, weapons, nuclear materials etc.) → security of the shipping containers supply chains → EU internal security: intensified exchange of security related information, border crossing collaboration (i.e. law enforcement and intelligence), interoperability of systems and harmonised standards → psychology of sects and terror organisations – understanding radicalisation → financing of illegal activities → analysis of civil unrest and riots → functioning of mega-cities e.g. no-go areas → use of biometric identifiers → protection of soft targets
Nuclear security	<ul style="list-style-type: none"> → preparedness, prevention, detection and deterrence of misuse of nuclear material and technology and related training → environmental protection and monitoring → CBRN+E security → Support to the Convention of physical protection of nuclear materials and facilities

Non-proliferation	<ul style="list-style-type: none"> → support to the implementation of Non-Proliferation Treaty → support to the Convention on chemical and biological weapons → strategic trade control
Data protection, cyber security and fight against cybercrime	<ul style="list-style-type: none"> → gathering and processing of information versus data protection –civil rights: protection of integrity and misuse of data. → privacy and confidentiality of end-users → data protection in cybersecurity information sharing → data protection by design and by default → data breaches and communication to data subjects → data mining for counter-terrorism and other law enforcement purposes → new threats and modi operandi → mapping of available data and data sources → better exploitation of new data sources → integration and resilience of cyber security systems → cybersecurity of autonomous systems → security assurance and certification → citizen involvement and behaviour in using cyber security tools
Critical infrastructure protection	<ul style="list-style-type: none"> → transport safety and security including aviation security → safety of buildings → secure and resilient supply chains → support to Convention of physical protection of Nuclear materials and nuclear facilities → security/resilience of vital services, networks and buildings → interdependencies between critical systems → resilient navigation and timing services infrastructures
Document security	<ul style="list-style-type: none"> → travel document security features

8. Migration and territorial development:

ISSUES	DESCRIPTORS
<p>Population flows</p>	<ul style="list-style-type: none"> → root causes and impact of population flows across all dimensions - social, cultural, economic, health, psychological, natural (i.e. climate change), etc. – and time horizons. → reliable data on refugees/other groups of migrants → mechanisms to anticipate and manage population flows → understanding the impact of free movement and migration in multi-cultural societies(e.g. welcoming policies, integration of immigrants, challenges and opportunities of the EU regions and cities and social inclusion) → social transfers and measures to maintain local food production & population
<p>Demography and urbanisation</p>	<ul style="list-style-type: none"> → implications of the evolution of demographic composition such as aging society, decreasing fertility, increasing poverty, different social and religious composition of the population and changes in foreign-born population. → increased urbanisation or reversal of the trend towards urban areas and implications for economic and social development → resilience and sustainability of cities and human settlements → different scenarios of urbanisation and the impact on EU objectives (climate, energy, social and economic)
<p>Regional development and equity</p>	<ul style="list-style-type: none"> → sustainable strategies to promote non-discrimination (social inclusion, social cohesion) and addressing economic disparities within (European Cohesion) and outside the EU (including cross border investment) → scenarios to support Cohesion policy development and territorial impact assessment → regional aspects of growth and employment → innovation ecosystems and governance in lagging regions → territorial approach to EU development cooperation and neighbourhood

	→ urban development
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9. Data & digital transformations:

ISSUES	DESCRIPTORS
Big data	<ul style="list-style-type: none"> → big data life-cycle including governance, validation and authenticity, interoperability and knowledge extrapolation → legal aspects i.e. data ownership, IPR, portability and retrieval, digital sovereignty → free flow of data, open data → space data → data interoperability → data for policy making → geospatial information management
IPR, copyright	<ul style="list-style-type: none"> → new forms of content monetisation
Societal impact and digital divide	<ul style="list-style-type: none"> → digital addictions → digital support to ageing population: including multilingualism, accessibility, speed of network and disability → social implications of digital revolution → digital services in developing countries → digital literacy
Emerging transformational technologies	<ul style="list-style-type: none"> → autonomous and intelligent systems including human augmentation, ubiquitous systems, remotely controlled systems → internet of things, → industry 4.0 → 5G Network Infrastructures → Satellite and Ground-Based Navigation Systems
Economic aspect of data	<ul style="list-style-type: none"> → value of personal data → digital value chain → data market business models

10. Innovation systems and processes:

ISSUES	DESCRIPTORS
<p>Open innovation, innovation ecosystems, and citizen innovation</p>	<ul style="list-style-type: none"> → innovative policy-making, the value of co-creation with society in design and implementation → new narratives of innovation → framework conditions for innovation and associated public investment (including risk capital, crowd funding and legal framework) → access to scientific resources and infrastructures → impact of framework programmes on growth, employment and excellence → role of standards, IPR → regional innovation ecosystems and smart specialisation → cross-sectorial innovation
<p>Open science</p>	<ul style="list-style-type: none"> → citizen engagement → citizen science, science 2.0 → science and technology studies → science networking and partnering
<p>Research integrity and scientific excellence</p>	<ul style="list-style-type: none"> → understanding inter/trans-disciplinarity → new concepts for assessing scientific excellence beyond metrics → stairways to excellence → IPR (patent paradigm)
<p>Production, management and transfer of knowledge</p>	<ul style="list-style-type: none"> → memories of the future: how to keep track of information; retain knowledge → role of education
<p>Technology and society</p>	<ul style="list-style-type: none"> → social reactions to science and technology → the impact of paradigm shifts on culture and technology; → economic impact of disruptive technologies → integrity, ethics and consumer protection; → competitiveness in and territorial uptake of Key Enabling Technologies (KETs)

Openness to the world	<ul style="list-style-type: none">→ research an innovation to help move towards Sustainable Development Goals→ research and innovation systems of key strategic partners and associated countries to H2020
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