National Research Council of Italy

MISSION EUROPE 2030

Position Paper on mission oriented approach

May 2018

Sommario

For any further information:

CNR Brussels liaison office – luca.moretti@cnr.it

michele.guerrini@cnr.it

pierfrancesco.moretti@cnr.it

angelo.volpi@cnr.it

Introduction

The National Research Council of Italy (CNR) is the largest public research institution in Italy.

CNR counts more than 8.000 employees, of whom more than half are researchers and technologists. Some 4.000 young researchers are engaged in postgraduate studies and research training at CNR within the organization's top-priority areas of interest. A significant contribution also comes from research associates: researchers, from Universities or private firms, who take part in CNR's research activities.

For a research institution such as CNR, since the very beginning in 1984, the EU Research Framework Programmes (FP) have been a fundamental tool to complement its institutional activities as well as to build and strengthen its scientific partnerships. Therefore, CNR is paying a lot of attention to the potential objectives and structure of the next Framework Programme.

CNR supports the approaches and messages in the Lamy and Mazzuccato reports calling for a mission programming to more efficiently tackle global challenges.

CNR acknowledges the necessity to give the missions a trait for feasible, scalable and measurable objectives based on research and with a clear public-private partnership effort.

This position paper introduces the CNR priorities in terms of Mission as seems to be devised by the EC within Horizon Europe (FP9).

Giving its multidisciplinary nature covering all the aspects of research CNR have conducted an internal consultation to build its own missions, in this regard, CNR identified six missions which address the main challenges clustered in Horizon Europe.

All these missions:

1) Call for a multi and trans-disciplinary approach,

2) Require a large contribution from research and innovation,

3) Clearly show a European added value.

Mission: Multi-purpose energy supply systems by 2030

Areas of intervention	Renewable/carbon-neutral energy integration in resilient infrastructures, Energy Storage Solutions, Clean and healthy Mobility, Digitalization, Economic Transformation, Protection and Security, Automation, Artificial Intelligence.
R&I Areas	▪ Energy sources for private e-mobility and public e-transportation; ▪ Multi-needs battery recharging solutions for urbanized and remote areas; ▪ Energy sources for marine and aerial manned and unmanned e-vehicles; ▪ Design of more efficient thermomagnetic technologies for heat recovery power generators; ▪ Novel supercapacitors for smart energy and magnetic storage; ▪ Flexible and conformable nanogenerators based on piezoelectric and tribolectric materials; ▪ Intelligent systems for energy supply and distribution; ▪ Intervention options to restore energy supply in natural and anthropic disasters; ▪ User-driven services for personalized access to energy supply based on big data, automation, machine-learning and new economic models; ▪ Knowledge-based models to incorporate social behaviour into decentralized management of energy storage and recharging systems

Mission: Safe Communications in Europe by 2030

Areas of intervention	Protection and security of data storage and transmission, Protection and security of digital infrastructures, Digitalization, Artificial Intelligence, Machine Learning.
R&I Areas	• Quantum cryptography for full protected small scale networks/grids; • Impact assessments of cyber attacks and adaptive intervention strategies for restoring service and zero-damage; • Energy efficient solutions for protection from cyber attacks and remediation of digital infrastructures; • Forecasting and identification of attacks based on big data, machine-learning and artificial intelligence; • Integrated and centralized EU alert system for intrusions in data communication; • Protection and security options for medical personal data storage and access; • Knowledge-based models to promote social awareness and proactive behaviour for protection and response to cyber attacks.

Mission: "Resilient Europe": risk assessment map and intervention options for safe management and investments by 2030

Areas of intervention	Protection and Security, Engaging Society, Disaster Resilient Society, Mobility, Critical Infrastructures, Climate Science, Preservation and Restoration of Natural Capital, Sustainable Ocean , Food and Water Systems, Digitalization, Automation.
R&I Areas	• Assess environmental impacts at regional scale by human activities (construction, transport, trawling, mining, dumping of materials and chemicals, productive systems). • Assess climate fingerprint (draught, sea level rise, coastal erosion, flooding, migration, disease) on societal behaviour, critical infrastructures and economic activities in rural, urbanized and coastal areas. • User-driven services for alert systems based on shared big data, automation and machine-learning. • Remediation, protection and responsive intervention options, including international and trans-national aspects, in vulnerable areas. • Knowledge-based models to incorporate risk perception and social behaviour-water-food-land-energy nexus into citizen responsibility and decentralized policy decisions.

Mission: World fed by the sun: Europe driving natural photosynthesis by 2028

Thematic area of intervention	Future-proofing food systems, Producing sustainably form land in agriculture and forestry, Renewable/carbon-neutral energy production and resilient smart cities and communities, Resource efficient and circular system with zero pollution, climate science
R&I Areas	- Generate climate-ready, future-proof, more productive and stress resilient plants - Improve food security and produce safer and more nutritious food (+30 crop yield % by 2028). - Characterize and ameliorate food nutraceutical and functional properties. - Trace and certify provenance, quality, and safety of food and livestock feed. - Provide food with reduced environmental footprints, and novel foods covering ca 20% of diets in Europe. - Personalize food and diets, for matching optimal nutrition requirements, prevent diseases, fight malnutrition, and assist healthy lifestyles. - Improve forest productivity and mitigate climate change by sustainably absorbing atmospheric CO2 (-20% by 2028, in cooperation with companion initiatives addressing decarbonisation by producing clean energy via artificial photosynthesis).

Mission: EU for P5: Predictive, Preventive, Personalized and Participatory medicine for Parkinson

Thematic area of intervention	Health and care systems, Development and uptake of new medical products, technologies and tools, Environmental and social determinants of health and wellbeing, Data-driven digital transformation of health care, Engaging and enabling citizens.
R&I Areas	- Early diagnosis for less invasive, more predictive and preventive medicine with tailored therapeutic approaches. - Smart bio-sensors, nanomaterials and miniaturized cost-efficient diagnostics tools. -Advanced technologies for high time and space resolution diagnostics, - Models of risk stratification profiles for prediction, prevention and personalization of therapies. - e-health, computational integrated systems (microbiota, omics). - Identification of molecular principles and synthesis of drugs, with their underlying metabolic transitions and functioning, pharmacokinetics, and toxicology. - *in silico* models, structure-based and fragment-based drug discovery, drug-target kinetics, chemo-informatics, and bioinformatics. - Real-time observations of sensors/drug response in the body. - Personalized diagnostics and multiple analytical technologies, for risk assessments of neurodegenerative diseases. - Knowledge-based models to include personal responsibilities and behaviours in contributing to the EU integrated health care system.

Mission: Europe propelled by the sun: Solar technologies bringing Europe up to 20% of energy supply by 2030

Thematic area of intervention	Renewable/carbon-neutral energy production and resilient smart cities and communities, Resource efficient and circular system with zero pollution, Digitalization, Economic Transformation, Resiliency to critical raw materials, climate science.
R&I Areas	▪ New materials and technologies for large scale uptake of third generation photovoltaics including application for Building Integration (BiPV), ▪ Sustainable and high–durability materials for advanced photovoltaic and photo–electrochemical technologies based on earth–abundant elements ▪ Solar technologies for portable-wearable photovoltaics including medical devices and implants ▪ Materials and solar technologies for depollution and desalination systems ▪ System understanding of artificial photosynthesis ▪ New manufacturing opportunities and business models related to solar conversion technologies ▪ Modelling socio economic impacts of solar technologies including cultural and legal aspects.