



EXECUTIVE SUMMARY

Europeans' Strategic Research Agenda for Integrated Spatial Planning, Land Use and Soil Management

HORIZON2020 CSA INSPIRATION

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Europeans' Strategic Research Agenda for Integrated Spatial Planning, Land Use and Soil Management

Land and soil play a vital role in meeting societal needs for food, drinking water, energy, shelter, infrastructure and overcoming societal challenges of climate change, non-renewable natural resources and environmental (in)justice. Land and soil, including water and sediment, are finite resources facing growing pressures and conflicts over their use that contribute to over-consumption of natural capital. "Business as usual" is not an option and a degree of urgency involving wise land use and soil management is needed to balance the supply of natural capital and ecosystem services with society's demands.

INSPIRATION recognised the interaction between the supply of, and societal demands on, natural capital that is in part created by land-use management practices whose net impact is insufficiently understood. This helped identify specific research needs on supply of and demand for natural capital, land-use management and net impact evaluation.

The INSPIRATION Strategic Research Agenda (SRA) is based on research and innovation needs identified by more than 500 European stakeholders working as funders, scientists, policy makers, public administrators, consultants.

The SRA considers soil and land use management challenges, including the links between the soil-sediment-water (SSW) system and topics such as health, energy, climate change, resilient water supply. It recognizes the need for new knowledge and new applications of knowledge to plan, manage and use land and the SSW system.

The SRA is designed to help public and private research funders identify research they should invest in to innovate and contribute to a greener, more socially cohesive, smarter and more competitive Europe.

The European Commission and several European countries seek to put the 17 United Nations Sustainable Development Goals¹ published in 2015 at the heart of their policy frameworks, priorities and budgets. Notably, the Commission "*commits to mainstreaming the SDGs into EU policies and initiatives ... and into the Commission's everyday work*". The stakeholder-driven research demands presented in this SRA map on to the SDGs and will enable the Commission and individual countries achieve these goals.

Transnational co-funding is key to creating synergies for organisations wishing to invest in research activities. Support for interested funders will be available until August 2019. National Contact Persons will be available for providing support and for making cross country contacts regarding specific research demands for co-funding. The complete agenda, background on its development and information about the National Contact Persons is available at www.inspiration-agenda.eu.

¹ <https://unstats.un.org/unsd/statcom/47th-session/documents/2016-2-IAEG-SDGs-Rev1-E.pdf>



This June 2017 Green Paper version contains preliminary proposals published in order to stimulate discussion, refinement and to inspire conversations with potential funders during the match-making phase of INSPIRATION.



Bottom-up Demand-Driven Research Needs

A set of 17 integrated and 22 thematic research needs have been identified. Thematic needs have been identified for Natural Capital and Ecosystem Services Supply (NC), Demand for Natural Capital and Ecosystem Services (D), Land Use Management (LM) and Net Impact (NI). The integrated needs (IRT) cut across these themes.

Integrated Research Needs

- IRT-1: Integrated Environmental Assessment and Soil Monitoring for Europe
- IRT-2: Recognizing the value of ecosystem services in land use decisions
- IRT-3: From indicators to implementation: Integrated tools for a holistic assessment of agricultural and forest land use
- IRT-4: Bio-Economy – unleashing potential while sustaining soils
- IRT-5: Integrated scenarios for the Land-Soil-Water-Food system under societal pressures and challenges
- IRT-6: Indicators for assessing the efficiency of the Soil-Sediment-Water-Energy system
- IRT-7: Farming systems to maintain soil fertility and yields
- IRT-8: Circular land management
- IRT-9: Policies to effectively reduce land consumption for settlement development
- IRT-10: Stakeholder participation to facilitate the development of liveable cities
- IRT-11: Integrated management of urban soils
- IRT-12: Environmentally friendly and socially sensitive urban development
- IRT-13: Urban Metabolism – Enhance efficient use of soil-sediment-water resources through a closing of urban material loops
- IRT-14: Emerging contaminants’ in soil and groundwater – ensuring long-term provision of drinking water as well as soil and freshwater ecosystem services
- IRT-15: Sustainable management to restore ecological and socio-economic values of degraded land
- IRT-16: Innovative technologies and eco-engineering 4.0: Challenges for sustainable use of agricultural, forest and urban landscapes and the SSW system
- IRT-17: Improving preparedness and response for climate change and related hazards

Natural Capital and Ecosystem Services Supply

- NC1: Quantity, quality and health of soils, soil carbon, greenhouse gases
- NC2: Biodiversity, organismic and genetic resources
- NC3: Water, water cycle
- NC4: Pollutant degradation, filtering and immobilization capacity
- NC5: Prevention of erosion and mudslides
- NC6: Geological resources
- NC7: Intrinsic values of soils and landscapes

Land Use Management

- LM 1: Governance, management mechanisms, instruments and policy
- LM 2: Climate change challenges for land management
- LM 3: Land as a resource in urban areas (Sustainable urban land management)
- LM 4: Land as a resource in rural areas (Multifunctionality of rural areas)

Demand for Natural Capital and Ecosystem Services

- D1: The 4 F’s: Food, feed, fibre, (bio)fuel
- D2: Regulating Ecosystem Services
- D3: Urban / infrastructure land
- D4: Water
- D5: Geological (and fossil) subsurface resources
- D6: Natural hazard prevention and resilience
- D7: Health and quality of life (living environment)

Net Impact

- NI 1: Developing impact assessment methodology
- NI 2: Understanding and assessing impacts of drivers and management
- NI 3: Trade-off analysis & decision support
- NI 4: Science-Policy-Society Interface



What's in it for funders, end-users, researchers, knowledge translators and citizens?

Funders

This agenda reflects research and innovation demand from a range of perspectives and organisations. It is based on evidence from over 500 stakeholders from across Europe of how Integrated Spatial Planning, Land Use and Soil Management can be improved and what benefits are anticipated from such improvements.

This bottom-up, demand-driven research agenda is intended to increase coordination and targeting of investment in research. There are many shared needs from more than 17 countries. Individual funders looking to invest their funds in more efficient ways may wish to co-fund specific research activities, including knowledge transfer.

Please contact us with details of which research needs you may wish to co-fund, indicating what budget you may be able to devote, timings for key decisions and any other information that INSPIRATION will help to bring together funders from across Europe to work together.

End users

End-users will use the knowledge created by research activity. They are involved in land use and management across the soil-sediment-water system will benefit from new knowledge to provide Europeans with the goods and services they need while protecting European and global environments.

End users have much to gain from being partners in research projects thereby helping to formulate projects, share pre-existing knowledge, help validate the outcomes and of course ensure findings are put into practice. Such end users include enterprises using or affecting land; drinking water and energy producers, distributors and suppliers; spatial planners, consultants, brownfield developers and remediation contractors; farmers, foresters and food companies; financiers; policy makers and regulators.

Researcher/ knowledge translators

Research creates knowledge that needs to be translated into policy, practice and across areas of application if it is to have an impact. The SRA presents researchers with the possibility of working on demand-driven research on needs defined by a unique bottom-up approach that might help in getting research projects funded.

Researchers and knowledge translators are provided with information on how working on the identified research needs will have an impact on addressing specific societal challenges should funding become available.

Citizens

Europe's citizens are the ultimate beneficiaries of resolving societal challenges. Their daily lives will be enhanced by the outcomes of the research activities in this agenda.

Projects related to societal challenges benefit from citizens being involved in planning, execution and reporting. This agenda has benefitted from local and detailed perspectives and non-technical contributions from citizen group representatives.

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Integrating Research Needs

Integrated Research need	Likely impact
IRT-1: Integrated Environmental Assessment and Soil Monitoring for Europe	Long term monitoring to show changes in soil quality to levels impacting soil function, food security and human health and to measure progress on land degradation neutrality.
IRT-2: Recognizing the values of ecosystem services in land use decisions	Assessing magnitude and societal distribution of costs and benefits of land use options (e.g. through cost-benefit analysis, cost-effectiveness analysis or multi-criteria analysis) can help mainstream the value of ecosystem services into decision-making.
IRT-3: From indicators to implementation: Integrated tools for a holistic assessment of agricultural and forest land use	A move away from segregated decision makers and scientific disciplines towards integration by location and across disciplines to assess the role of agricultural and forest land use types or climatic regions (e.g. Nordic, Mediterranean) in meeting societal demands and local socio-cultural backgrounds. Research will develop (regional or land use type specific) methodologies for an integrated assessment.
IRT-4: Bio-Economy – unleashing the potentials while sustaining soils	Unleash the potential of soil to sustain a bio-economy in Europe by better understanding soil and economic systems in order to support land management for biomass production and consumption. Alternatives to non-renewable resources are needed. Soils can provide bio-based resources, but overuse must be prevented to sustain soil system functions.
IRT-5: Integrated scenarios for the Land-Soil-Water-Food system under societal pressures and challenges	Identification of land use scenarios that deliver benefits to society AND to the environment and lead to changes in soil management and spatial planning. Growing populations increase soil and land degradation thereby rendering the remaining scarce fertile soils vulnerable to overuse and further degradation. Scenarios modelling will help assess major impacts and decrease further degradation, secure food and identify ways of achieving land degradation neutrality. Changes in the economy and the society should estimate like growing / shrinking areas and their impact to the land-soil-sediment-water system.
IRT-6: Indicators for assessing the efficiency of the Soil-Sediment-Water-Energy system of resources	National, regional, local authorities would benefit from a more global and informed vision of the utility (private and public) of their decisions if they were supplied with indicators helping to measure the consequences of their decisions on the natural resources. This “footprint” type of indicators will permit a statistical scoreboard to be used to analyze environmental impacts through the whole global economic cycle and thus better balance societal benefits and ecological effects of different resource-use options.
IRT-7: Farming systems to maintain soil fertility while meeting demand for agricultural products	Understanding the potential of different agricultural food production systems while maintaining soil fertility and reducing negative environmental impacts associated with intensive conventional farming. Increased knowledge about economic and technical aspects of organic food production systems will improve their competitiveness and help mainstream sustainable agricultural practices.
IRT-8: Circular land management	Research is required to understand the patterns of behaviour and interdependencies of actors, especially land owners, active in land-related policy areas on a theoretical and practical level. It is important to combine the strategies and instruments by circular land management through applied research and pilot case studies and in the sense of modular “tool boxes” to qualify a sustainable land management.
IRT-9: Policies to effectively reduce land consumption for settlement development	Knowledge on how to design effective policies given the institutional constraints of their implementation and enforcement will be necessary to realize the benefits of reduced land consumption in rural and urban areas.



Integrated Research need	Likely impact
IRT-10: Stakeholder participation to facilitate the development of liveable cities	Understanding the potential of stakeholder participation will help to ensure the liveability of urban development and enhance transparency and legitimacy of decision-making.
IRT-11: Integrated management of soils in urban areas	Better understanding the role of urban soils in improving quality of urban space and consequently on health and living quality.
IRT-12: Environmentally friendly and socially sensitive urban development	Solutions that bridge the goals of urban environmental protection and social concerns of urban development are crucial to realize sustainable cities. Knowledge on environmental issues in urban planning as well as on social concerns is partly available but has to be deeper, up to date and better integrated.
IRT-13: Urban Metabolism – Enhance efficient use of soil-sediment-water resources through a closing of urban material loops	Without further development of the methodological concept of urban metabolism, it will be not possible to identify comprehensive measures to enhance urban resource efficiency, consistency and sufficiency. Urban metabolism instruments and tools are needed at different scales (local, regional, national and supranational) to address indirect impacts, such as rebound effects or indirect land consumption. Such new instruments and tools will help manage our common resource basis, minimize negative ecological effects, foster the local economy through a circular urban economy and support a long term, high level of urban quality of life.
IRT-14: Emerging contaminants’ in soil and groundwater – ensuring long-term provision of drinking water as well as soil and freshwater ecosystem services	Greater knowledge about the properties of ‘emerging’ contaminants, and mixtures, their distribution in groundwater and soil, their toxicity to humans as well as soil and freshwater ecosystem services is needed to ensure public health and long-term provision of ecosystem services. Methods of analyzing emerging contaminants are needed.
IRT-15: Sustainable management to restore the ecological and socio-economic values of degraded land	Dedicated research will elaborate degradation-type and region-specific restoration and rehabilitation approaches for valorization of degraded areas.
IRT-16: Innovative technologies and eco-engineering 4.0: Challenges for a sustainable use of agricultural, forest and urban landscapes and the SSW system	Improved rural and urban land use through appropriate sustainable technologies, exploitation of comprehensive data collected by high-quality on- and off-site sensors, and purposeful communication. Eco-engineering for the design, monitoring and management of rural and urban ecosystems can integrate human society into the natural and man-made environment. Identifying what is a sustainable intensification via industrial or organic agriculture and forestry will help planning and permitting.
IRT-17: Climate change challenges - improving preparedness and response for climate conditions and related hazards	Spatial planning could be an instrument for coping with effects of climate change, but only if we have a better understanding of climate change mitigation, adaptation and counteracting negative climate phenomena. Integrated strategies on soil protection and land management should help reduce direct and indirect impacts from climate change. New technical and operational solutions can be developed using low cost, widely available data science.



Natural Capital and Ecosystem Services Supply

Research need	Likely Impact
NC1: Quantity and quality of soils, health of soils, soil carbon, greenhouse gases	Land use conflicts may be solved by sustainable land use management concepts based on natural capital and the multiple ecosystem services provided by the soil-sediment-water system.
NC2: Biodiversity, organismic and genetic resources	Biodiversity loss will be halted when the societal benefits of biodiversity and ecosystems is quantified for different areas.
NC3: Water, water cycle	The delivery of the water demanded by society will become more stable and resilient to environmental and societal change, which will contribute to more safe, sustainable and healthy societies.
NC4: Pollutant degradation, filtering and immobilization capacity	We will be able to manage the legacy of soil contamination from the past more cost-effectively and sustainably, with knowledge on the natural capacity of the SSW-system to detoxify contaminants.
NC5: Prevention of erosion and mudslides, natural hazards	This research will reduce the occurrence, duration and severity of natural hazards, by developing alternative land use management strategies that will increase the natural resilience to floods, fires, land subsidence, erosion and landslides.
NC6: Geological resources	This research will decrease the environmental and societal impact of resource recovery, and protect natural capital by promoting recycling and use of alternatives. It will contribute to the transition towards a circular economy.
NC7: Intrinsic values of soils and landscapes	Aesthetic, cultural and social values of landscapes will be preserved better.

Demand for Natural Capital and Ecosystem Services

Research need	Likely Impact
D1: The 4 F's: Food, feed, fibre, (bio)fuel	This research will strengthen the transition towards a circular and biologically based economy, by quantifying the societal demand of this transition for soil functions.
D2: Regulating Ecosystem Services	Assessment and mapping of soil ecosystem services are prerequisites for sustainable management of natural resources, to optimize soil functions and services.
D3: Urban / infrastructure land	This research will contribute to land use conflict management, the liveability of shrinking regions and villages, and increased brownfield remediation and re-use of land, which will safeguard soils for other purposes.
D4: Water	Current and future water demand scenarios will enable more futureproof land use decision making to ensure the delivery of sufficient and clean water for future generations.
D5: Geological (and fossil) subsurface resources	This research will help decrease the environmental and societal impact of resource recovery, decrease demand by promoting recycling and use of alternatives and contribute to the transition towards a circular economy.
D6: Natural hazard prevention and resilience	This research will reduce the occurrence, duration and severity of anthropogenically triggered natural hazards; reduce vulnerability by developing alternative land use management strategies, and; increase resilience to a range of hazards including floods, fires, earthquakes, volcanic eruptions, land subsidence, erosion and landslides.
D7: Health and quality of life (living environment)	Research on the contribution of nature to health and well-being will allow for better spatial design to optimize these health benefits, especially with respect to vulnerable groups in deprived areas.



Land Use Management

Research need	Likely Impact
LM 1: Governance, management mechanisms, instruments and policy	Improved policies, governance structures and institutions to promote sustainable land management throughout Europe.
LM 2: Climate changes challenges for land management	This will enable the design of effective and suitable spatial planning and land use management systems, to deal with extreme weather events, flooding, droughts and environmental stresses.
LM 3: Land as a resources in urban areas (Sustainable urban land management)	This research will contribute to the development of an healthy urban environment and sustainable and safe cities.
LM 4: Land as a resources in rural areas (Multi-functionality of rural areas)	This research will contribute to maintaining and improving soil fertility, and improved nutrient and pesticide management. It will also stimulate nature conservation and will provide options to deal with urban sprawl and rural depopulation, as well as to avoid land speculation.

Net Impact

Research need	Likely Impact
NI 1: Developing impact assessment methodology	Developing monitoring and impact assessment methodologies will enable us to detect and assess emerging threats from global change (such as climate change), land management and pollution to human health and well-being, biodiversity and ecosystem service provision as well as the prosperity of our economies.
NI 2: Understanding and assessing impacts of drivers and management	This research will provide us with an understanding of the magnitude of the ecological, economic and social impacts of land management decisions, emerging and/or mixed pollutants, socio-economic drivers of land management and land use change, and policies, planning and regulation.
NI 3: Trade-off analysis & decision support	Research on comparative assessment of land management options will support realizing synergies and trading off conflicts between different societal demands with regard to land use and land management.
NI 4: Science-Policy-Society Interface	Strengthening the science-policy-society interface will facilitate knowledge-based development and implementation of land use policies by awareness raising, stakeholder involvement and policy integration.