Seeking a new strategic research agenda on soil, land-use and land management in Europe

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Abstract

The way we steward soil resources and manage our land use activities is central to ensuring Europe's transition to a sustainable future for its citizens and its global partners. Research and knowledge dissemination are fundamental to securing soils and land for next generations, for competitive economies and healthy landscapes. Clever use of the services provided by the soil-sediment-water system provides solutions for meeting societal needs and for overcoming societal challenges. In order to create a new strategic research agenda (SRA) on soil, land-use and land management in Europe, it was collected relevant information on research demands, based on key stakeholder interviews, workshops and desk exercise from 17 European countries. This investigation revealed the research needs that should be included in the European SRA. According to key stakeholders the societal challenges facing Europe increasingly require research and innovation which integrates different approaches from across research disciplines. These often increase the impact and usefulness of the research for businesses and society. It was highlighted the need to improve the dissemination procedure and was suggested enlarged stakeholders' involvement in research projects. The dissemination of projects should include indicators to access the social impacts, policy implications and applicability demonstrations. Strategic partnerships between universities and enterprises were recommend, and a clear and accessible cost-benefits analysis, to increase the added value of research was emphasised. Furthermore, stakeholders consider important to facilitate the access to existing databases and scientific publications through thematic online platforms. Concluding the inquiry, the stakeholders consolidated recommendations on the future projects, which should promote interdisciplinary teams, integrate economic,

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social and environmental aspects, ensure mixed funding establishments, and assure social acceptance and findings applicability.
Keywords: strategic research agenda, stakeholders, land-use, land management.

1 Introduction

Land is a limited resource and sustainable land management seeks to balance the demand and supply of natural capital, handle with the effects of the driving forces putting pressure on the system and decrease the global footprint of human activities. To design sustainable strategies of land management and to decide from alternative uses of land it is indispensable to determine the biophysical and socio-economic indicators and causes of resource degradation, both through scientific knowledge and from the perception of local populations [1, 2]. Research is necessary in order to facilitate sustainable land management and support evidence based policy making to a more sustainable future for Europe's citizens and its global partners. Policy is essential because governments can promote the wise use and management of land. The instruments include local, regional and international laws, agreements or programs, and public education is probably the most important tool in the long run. Unfortunately, one of the reasons for inadequate implementation and adoption of sustainable land management is the lack of adequate mechanisms and channels for scientific knowledge transmission, and dialogue between science and police-makers [3, 4]. There is an urgent need to improve communication of scientific findings such that they inform policy at all levels. For that, the completed knowledge on land degradation must be interdisciplinary and have cross-sector approaches, providing a deeper insight into the socio-economic and policy aspects [5]. To ensure such interdisciplinary, the research methods must extend over the academic boundaries, enabling non-academic stakeholder engagement and the inclusion of practical questions.

Multi-stakeholder approach is increasingly being promoted and implemented in social, environmental, and sustainability management research. Many studies have advocated and demonstrated the importance of the stakeholder participation (as land-users, decision makers or experts) as an integral component over the development of some sustainable management initiatives and strategies [6,7,8 and 9]. The iterative process, that includes knowledge exchange between scientists and potential users, it is fundamental not only to facilitate the application of valuable scientific knowledge on practice, but also to inform scientists about research needs and priorities from decision and policy-makers perspectives [8, 10]. Such information would be beneficial to consolidate research agendas and programs, addressing challenging and multi-faceted problems [9, 11]. The involvement of key stakeholders helps to take into account local realities, strengths, and constraints when developing appropriate strategies, and can also reduce the level of conflict among participants [6]. Stakeholders based research creates a sense of ownership over the process and outcomes, and could increase the likelihood that knowledge and evidence will be used on practice decisions and policies, thus increasing their quality and durability [7, 8].

In that context arises the Coordination and Support Action INSPIRATION (Integrated Spatial PlannIng, land-use and soil management Research Action), financed from European Union under the Horizon 2020 program. The consortium comprises 21 partners from 17 European countries. The project aims to establish and promote the adoption of a strategic research agenda (SRA) for land-use, land-use changes and the related, impacted SSW system in order to meet current and future societal challenges and needs facing Europe. For that, a specific methodology was applied, in each country, to collected information on research and innovation needs, experiences and suggestions regarding connecting science to policy/practice, and existing and promising national and transnational funding schemes. This paper presents relevant national information from Portugal.

2 Materials and methods

INSPIRATION is based in a bottom-up approach towards developing, delivering, match-making and promoting of a Strategic Research Agenda for land and the soil-sediment-water system, land-use changes and soil management addressing the societal challenges in Europe. The multi-national methodology was built on a multi-stakeholder and interdisciplinary approach, applied by National Focal Points (NFPs) working as knowledge exchange facilitators. Before the procedures to collect information, as for the other countries, in Portugal, a group of National Key Stakeholders (NKSs) was defined in order to include a variety of stakeholders from public bodies, business, scientific community, society, and relevant funders, across the various soil and land management disciplines [12].

Different approaches have been used to review research themes, identify knowledge gaps, questions and indicators from stakeholders, and develop research agendas for environmental management [9, 11]. On this project, it was applied personal questionnaires by interview, performed a desk study and organized a final 2-day workshop discussion [13]. The outcomes of the collation of demands for research are taken up and reviewed following a conceptual model described in the next section.

2.1 Conceptual model

The main EU-societal-challenges which are expressed in the Horizon 2020 work programs inherently straddle disciplinary boundaries and changes in one sector can have undesirable and unexpected consequences in another. These challenges must be tackled to benefit from the land and the SSW system and still to protect the natural capital and resources. Consequently, such challenges should be met on the SRA development process, and research topics must demand for multi-dimensional and intra-disciplinary approaches. Therefore, in order to identify cross-country and cross-sectoral knowledge gaps, research questions are structured along four overarching perspectives within a conceptual model (Figure 1).

This conceptual model assumes the importance of land and the SSW systems as goods and natural capital stocks. However, there are multiple natural, land-use,

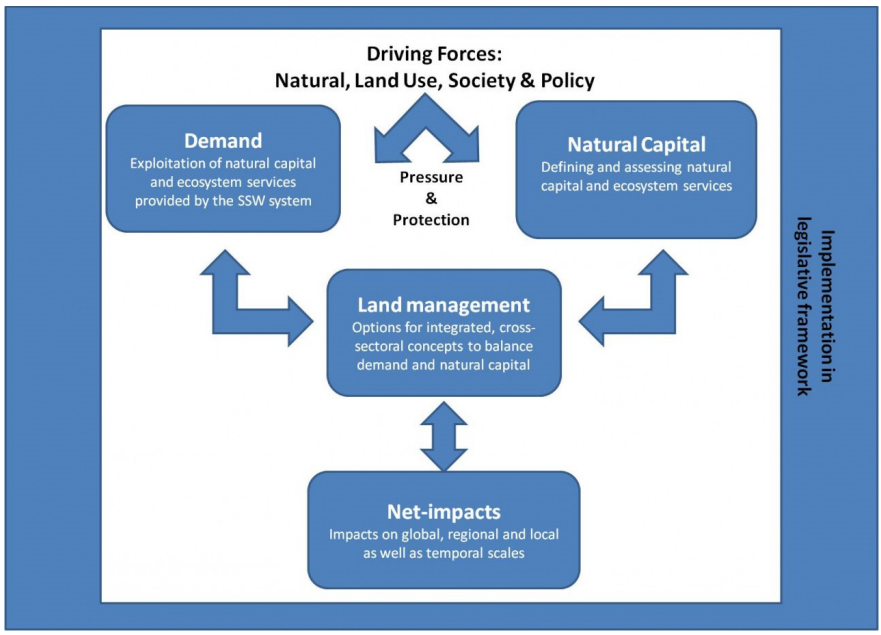

Figure 1: Conceptual framework of the project Inspiration [14].

society and policy drivers which affect these natural resources, their potentials and as well as their use, contributing to ecosystem degradation. An imminent question is the conflicting interests regarding land-use among the relevant stakeholders in a society (farmers, land planners, citizens, etc.), that leads to the paradigm of 'Either-Or': expectations of land-users towards maximizing economic benefits of natural resources stocks and goods on the one hand, and maximum requirements from societal groups towards different protective regulations on the other. Therefore, the sustainable management of land resources (agricultural, forest and urban) has to follow integrated, cross-sectoral concepts concerning the different demands of stakeholders. And lastly, on this process of natural capital management, the economic, societal, administrative and political impacts have to be assessed. Thus the net-impacts on local, regional, global as well as temporal scale are significant back-coupling effects and determinants of crucial importance [14].

The proposed conceptual model arises from the recognition of such complexity, necessary to take into account when analyzing the national situations and formulating the SRA around. It links four themes: resource demand and efficiency; defining and assessing natural capital; land management; and net-impacts on global, regional and local scale. Summarily, these themes aim to group research gaps concerning sustainable land management stewardship along four questions [14]:

Demand: What does society demand from natural capital and ecosystem services including the SSW-system?

Natural capital: What has nature, including the SSW-system to offer and which determinants sustain the system?

Land management: What are options for an integrated, cross-sectoral land management to balance societal demands and natural capital?

Net impacts: What are the impacts of different options of managing natural capital, including the SSW-system on global, regional and local as well as temporal scales?

2.2 Desk exercise

The desk-exercise has been done since the beginning, complementary to the methods mentioned, and the obtained information can be seen as supportive/underpinning to the information provided by the NKSs. Via a desk-exercise NFPs investigated, organised, and summarized information obtained through interviews and workshop (publications, reports, etc.). This step was particularly important to identify/verify relevant documents, programmes or agendas suggested by interviewees. Moreover, it was essential to structure research questions according the conceptual model.

2.3 NKSs' interviews

The personal questionnaires and interviews are common methods and aim to point to stakeholders' own perspectives. A questionnaire template for interviews of the NKSs by the NFPs was prepared [15]. The template is meant as a guide with sample questions and points of attention for the discussion with the NKSs. It is not prescriptive and not restrictive, the topics in the questionnaire are guiding and sample questions can be used as example. The questionnaire aims to obtain the information needed to give a foundation to the SRA at national levels regarding three mainly domains: research and innovation needs; connecting science – policy/practice; national and international funding organizations and schemes. In Portugal, 20 NKSs were interviewed and selected to represent different disciplines and institutional backgrounds including: land-use planners; managers; soil, sediment and water experts; researchers, funders and regulators/policy makers.

2.4 National Key Stakeholders' Workshop

Workshops were mentioned has beneficial as "learning space", in which the sharing of experiences can foster learning for participants and lead to new, creative ways of thinking about the process-based challenges [16]. It was organized at national level a 2-day workshop in 2015 (Figure 2) where the collated information (NKSs interviews and desk-exercise) was reviewed, synthesized and prioritized by the NKSs, under NFPs facilitation.

The workshop in Portugal took place at the University of the Algarve on 6–7 November, 2015. More than 20 experts from public and private funding institutions, research organizations, industry, NGO and regulation participated in the workshop, including the interview applicants. The workshop focused on different sections (Figure 2).

Figure 2: Two-day workshop sessions in Faro, Portugal.

After receiving the NKSs, NFPs made an informative presentation about the INSPIRATION project, and review and synthetize information already collected by interview and desk-exercise. Afterwards, NFPs facilitated three parallel sessions for discussion according the key domains (strategic research agenda topics, science-policy interface and possibilities for funding). Finally, conclusions were drawn up in a plenary session where the results of the three parallel theme groups were presented and integrated.

3 Results and discussion

3.1 Societal challenges

Societal challenges were discussed during the interviews, since it is inevitably connected to the topics to be included in the SRA, and may be used as bases for defining of the overarching themes for aggregating such research needs. On the graphic it's shown the percentage of NKSs' answers for each challenge (Figure 3). Food security and secure water supply can only be achieved through a sustainable

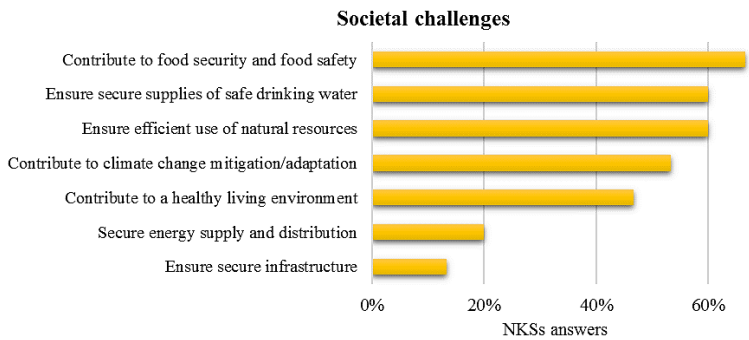

Figure 3: NKSs' opinion on importance of societal challenges.

management of agriculture and ecosystems in rural areas. These are challenged by business-as-usual agricultural practices. Contribute to food security and food safety, ensure secure supplies of safe drinking water, and ensure efficient use of natural resources are societal challenges more frequently mentioned as priority and urgent for Europe, during the interviews and the workshop. Contribute to climate change mitigation/adaptation and contribute to healthy living environment are also important challenges with more than 50% of NKSs' answers. Secure energy supply and distribution and secure infrastructure were considered less priority comparatively to the other challenges.

3.2 Research needs/topics for the SRA

A synthesis of specific topics to include the SRA, indicated by the NKSs in Portugal, was done. It was reported many research questions aggregated in main ten topics. Below the research topics were summarized according to the interview and workshop discussions about why it is relevant and form whom, who will be affected and responsible. The specific questions were arranged according the conceptual model through desk exercise.

PT1. Soil Conservation – Sustainable land management, soil fertility, soil regeneration, carbon soil sequestration, social awareness.

PT2. Opportunities of innovative and sustainable agricultural technologies – Organic farming; sustainable practices; potential productivity of land; waste compost options; water use efficiency.

PT3. Strategies for minimization and remediation of soil/water pollution.

PT4. Combating desertification – climate change, soil erosion and land degradation.

PT5. Promoting urban green infrastructure – grass management; urban agriculture; green-roofs.

PT6. Urban planning and redevelopment – Brownfields redevelopment; multicultural cities; ageing; shrinking cities.

PT7. Impact of agricultural policies – environmental effects; socio-economic transformations; rural development.

PT8. Competition between land-uses – land-use efficiency; bioenergy demand.

PT9. Soil system mapping and monitoring.

PT10. Resource efficient economy with a sustainable supply of raw materials – multifunctional forest; Mediterranean landscape; non-wood forest products.

3.3 Science-policy-practice

"Scientific knowledge" was essentially described, by NKSs in Portugal, as the acquired new knowledge obtained through scientific methods, including practice, experimentation and validation, to achieve specific objectives. NKSs revealed to use newly knowledge regularly and fundamentally to support land management, planning and decision making process, to produce innovative new products and methods, and also, on the academic field for dissemination through writing papers and teaching. The mainly sources to learn about are the scientific papers, conferences, reports and data bases (Figure 4). Television and newspapers are the

lowest mentioned. Depending on their position and sector, NKSs were involved on the formulation of research questions, or on doing scientific research, or synthetizing it for policies and decisions. Some suggestions were done so that the obtained knowledge, from future scientific research, can be useful in practice and known in the wider society, namely: improve the results dissemination; include the involvement with the stakeholders/entities in the future research projects; facilitate the access to data bases and scientific publications through online platforms; improve the management and identification of national research projects through a platform; monitoring the practical application of policies and actions; valorize human resources; and improve connections between regional entities. Institutional barriers, conflicts of interest, gap between research and society, unclear investigation objectives, bureaucracies and the thematic concentration should be avoided.

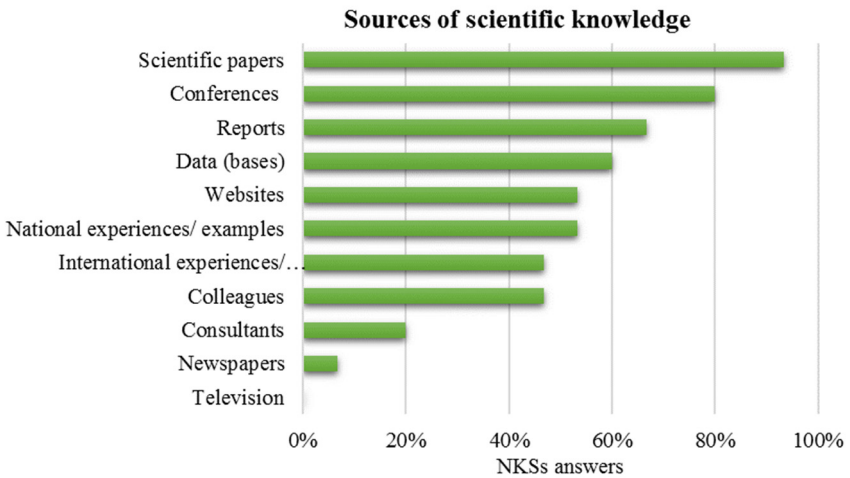

Figure 4: National Key Stakeholders sources of knowledge for soil/land issues.

3.4 Funding schemes

Several regional, national, European and international funding schemes were suggested by NKSs that could offer opportunities for research on soil, land-use and land management. Some NKSs consider the current funding options successful because usually promotes the creation of networks for continuation of research, but other reflects the low applicability of the research results on decisions or policies. To overcome it, they consider indispensable the requirement of the practice component in the funding programs, with the results demonstration and divulgation. On the other hand, the establishment of demonstrators set visibility to the results of the research, and the marketing of the results it's considered fundamental to get fund and recognized by the research funding communities. NKSs reflect during workshop sessions that it would be essential that scientific

results from ongoing and finished projects are available through dissemination platforms (including cost outcomes assessment), for information, coordination and for awareness of possible future partnerships. It also could help to avoid the funding on already studied aspects.

To increase the added-value of different financial resources for doing research that contributes to national and EU demands, NKSs consider fundamental a higher connection between research institutions and enterprises with specific and possible connected needs for scientific knowledge. There is general consensus that public-private partnerships can be a solution. It was also discussed the potential of multidisciplinary research projects and programs to achieve a multiplier of monetary funds. Though, NKSs think that to avoid the difficulty to recognize some integrated approaches related to land-use and management and SSW systems, it's necessary the definition of target sectors for research funding, that represent a line and mechanism with not only social and economic objectives but also concerning ecosystem sustainability.

The project's findings should be emphasized near local and regional communities so that people can understand that research funding money is necessary for the country development and sustainability. Over the last 40 years, there has been an evolution on the environment policies, however it's necessary to develop the population culture and awareness in environmental questions.

4 Conclusions

The societal challenges facing Europe increasingly require research and innovation which integrates different approaches from across research disciplines. These often increase the impact and utility of the research for businesses and other users. Towards the elaboration of European SRA on land and SSW management, specific information was collected and analyzed for Portugal. A clear vision of research state-of-the-art, needs/priorities, difficulties between science and practice/policy and funding prospects were obtained strategically among stakeholders.

Concluding the national activities of INSPIRATION project, it can be perceived that Portuguese NKSs are conscious about land degradation pressures and its effects, and on the need of innovative and sustainable ways of land management with respect to environmental quality and human well-being [17]. Besides, aware of some difficulties and gaps on science-practice interface and funding processes, NKSs consolidated recommendations on the future research projects on soil, land-use and management, which should promote interdisciplinary teams, integrate economic, social and environmental aspects regarding priorities and topics mentioned, ensure linkage between research institutes and companies facilitating funding establishments, and guaranty social acceptance and findings applicability.

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