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Towards a more responsible sustainable innovation assessment and management culture in Europe

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ABSTRACT
This article presents new concepts and practical approaches resulting from the piloting of CASI-F – a common framework for the assessment and management of sustainable innovation (SI). Based on lessons learned from action research carried out in the context of the EU funded CASI project, the article focuses on the meta-analysis of 46 action roadmaps produced with 43 innovators supporting the practical application of CASI-F. The applied methodology helped to demonstrate that a multi-level and multi-actor advice approach promotes a shift towards improved understanding of innovations-related critical issues (barriers, drivers, opportunities and threats) and stakeholders' relations, as well as their management, thus promoting the sustainable resilience and transformation of socio-technical systems. This paper first reflects on how we arrived to managerial lessons from the actions roadmaps and how could these lessons be used to assess the current state of affairs and potential way forward for European initiatives and instruments promoting sustainable innovation.

KEY WORDS
sustainable innovation, management, resilience, action roadmaps

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Introduction

There is general difficulty in defining the concepts of sustainability and sustainable innovation (SI). Just as in Dr. Seuss's (Theodore Geisel) poem "Too many Daves" where Mrs. McCave had 23 sons and called each of them Dave, sustainable innovation as a term has multiple meanings and serves multiple purposes (including greenwashing), thus leading to misperceptions that, in turn, hamper the ability to effectively manage SI. To add even more complexity, this already fuzzy term is also used interchangeably with other, similar concepts, such as "eco-innovation", "environmental innovation", etc., even though these concepts do not entail the social aspect of sustainability (Charter & Clark, 2007). Improved conceptual understanding of SI, especially in relation to complex

societal challenges, to which sustainability efforts aspire to attend, shall be inclusive and dynamic so as to embrace the transformational nature of global changes. For this reason, the CASI project set out on an ambitious journey that allowed getting past a few misconceptions about SI.

During forty months of the CASI project, based on an ongoing study of SI including systematic mapping of SI initiatives, pilot studies with innovators, desk research and other mobilisation and mutual learning initiatives (followed by a multi-actor, multi-level and multi-perspective analysis), a sequence of CASI working definitions of SI has been conceived, which, integrated into the final definition (presented in the findings section) offer a holistic interpretation and improved conceptual understanding of SI. In other words, the CASI definitions of SI incorporated the perspectives of sustainable innovators (46 pilot studies), EC environmental research programmes (FP5, FP6, FP7 and Horizon 2020), citizens (27 research priorities from citizen-expert-citizen process), Pan-European SI stakeholders (online survey consultation, stakeholders workshops, policy dialogues) and environmental scholars (Porter & van der Linde, 1995; Fussler & James, 1996; Kemp & Arundel, 1998; Rennings, 2000; Andersen, 2002; Geels, 2002, 2005; OECD, 2005, 2009; Charter & Clark, 2007; Kemp & Pearson, 2008; Oltra, 2009; Carrillo-Hermosilla et al., 2009, 2010). CASI definition of SI highlighted the need to consider a wider range of sustainable innovations (i.e. 7 types of SI), the multiple roles of SI stakeholders, as well as management levels and dimensions of SI. All these considerations can support the assessment and management of sustainable innovations and their systemic transformations. Management actions, therefore, ought to consider multiple aspects for an action to be effective. Ten management key aspects associated to four dimensions were identified through direct interaction with the innovators, which underpinned the development and piloting of a common framework for the assessment and management of sustainable innovation (CASI-F) and gave rise to 150 meta tasks for SI management. The latter represent a practical set of take away lessons from supporting managerial decisions through 460+ actions related to the identified aspects, which arose from the application of the CASI-F framework, and in particular, step five (described below). We have then explored the usefulness of these lessons in assessing the status quo of four European initiatives and instruments and reflected on the way forward.

The findings, presented in this paper, thus aim to support the creation of contexts capable of addressing the complexity of socio-economic transformations related to SI, explore management issues associated with the attitude and aptitude of involved people, and improve the process that would lead to sustainable impact of an SI.

By discussing the *status quo* and possible way forward, the paper suggests that monitoring and evaluating the way European initiatives and instruments (both national and cross-national) support specific SI management key aspects could foster a more responsible sustainable innovation (RSI) assessment and management culture in Europe.

1. Methodology

The common framework for the assessment and management of sustainable innovation (CASI-F) was designed and implemented around five steps (Fig. 1). The overall methodology followed an inductive, bottom up orientation to understanding the complexity and dynamics of SI, and the multiple factors that influence their development, resilience and sustainability.

Step One "Sustainability relevance and scanning" involved scanning and nominating 548 sustainability-driven innovations with a focus on the European Commission Horizon 2020 Framework Programme's Societal Challenge 5 (i.e. Climate Action, Environment, Raw Materials and Resource efficiency) related priorities.

The SI scanning or nomination phase was then followed by Step Two "Multi-criteria analysis and assessment" that comprised of an in-depth assessment and analysis of 202 sustainable innovations in terms of their practices, outcomes and players. This second step was conducted through desk research supported by the CASIPEDIA knowledge co-creation tool and some interviews of selected innovators.

Step Three of CASI-F focused on "Critical issue analysis and assessment" considering the barriers, drivers, opportunities and threats that could potentially influence the development and sustainability of a SI. Over 1700 critical issues were identified and prioritised in close collaboration with 43 innovators and the non-restricted ones are available in the CASI "Ideas Bank". 60 managerial lessons from multiple perspectives (i.e. technological, environ-

mental, economic, political, social, ethical and spatial) were drawn based on the analysis of data set collected.

Step Four "Multi-level advice management" used a multi-level actions approach and resulted in 700+ actions for the quadruple helix of SI stakeholders, at three levels of management (i.e. strategic, tactical, operational), to previously prioritised critical issues. The actions were prioritised by the innovators in terms of importance, feasibility and their potential impact on the environment, society and economy. Primary research, such as face to face or telephone interviews and focus groups, was used in the assessment and prioritisation of multi-level actions.

Step Five "Action roadmaps management" aimed to develop sub-actions that allow to more effectively implement and manage selected actions. According to feedback from SI innovators involved in the piloting of CASI-F, "the five steps, especially the Action Roadmap methodology, were found to be satisfactory or highly satisfactory by 80% of the respondents. 86% of the innovators suggested that developing an action roadmap can support them in managing their innovation and 77% would consider putting them into practice" (Anttila, 2016). The sub-actions or tasks of the CASI-F roadmaps were structured around four management dimensions (context, people, process and impact) and ten management key aspects (momentum, foresight, resources, mobilisation, aptitude, attitude, catalysts, fosterers, transformations and sustainability) that emerged from the analysis of SI initiatives mapped and studied in CASI. The systematic analysis of 550+ tasks and 350+ themes related to actions prioritised by innovators involved in the CASI Pilot, which helped to identify 15 meta-tasks for each of the ten SI management key aspects framing the action roadmaps co-created with the innovators.

43 innovators from 12 EU countries were involved in the CASI-F Pilot and created 46 action roadmaps with the support of CASI partners. By analysing these action roadmaps 150 meta-tasks were identified (Appendix). Although the selected action roadmaps covered all four types of SI actors (i.e. government, business, civil society and research and education), the emphasis that the CASI Pilot put on technological and social innovations is clearly reflected in the more prominent number of roadmaps addressing actions of relevance to business and civil society actors and resulted in the following distribution of roadmaps:

- 48% for business actors,
- 28% for civil society actors,
- 20% for research and education actors,
- 4% for government actors.

The low number of action roadmaps addressing the government is due to the fact that the selected innovators found unlikely that they could make an impact on governmental actions.

Fig. 1, also known as the CASI-F journey, represents the mobilisation and mutual learning (MML) process and related interconnections of steps that led to the development of 46 action roadmaps and 150 meta-tasks, which were used in this study.

Overall, steps 1-3 focused on SI assessment led to the identification of 60 managerial lesson, as well as

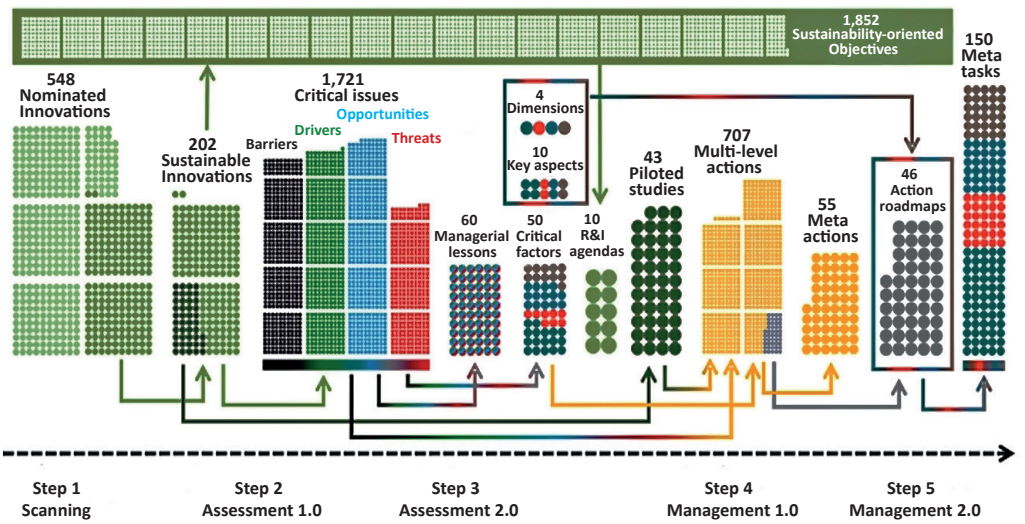

Fig. 1. The CASI-F Journey: Evolution of the common framework for the assessment to management of SI

Tab. 1. Multi-level and multi-actor aspects of SI management

Multi-Level & Multi-Actor approach	Government	Business	Civil society	Research and education
Top-level management: Strategic actions	Strategic actions involve the definition of high-level aims, challenges, goals, objectives and priorities that require strategic attention or orientation from top-level decision-makers in government, business, civil society, research and education organisations			
Mid-level management: Tactical actions	Tactical actions require mid-level decision-makers to translate strategic level objectives and priorities into tactical interventions, such as investment, research or knowledge transfer programmes and calls, funding schemes or instruments as well as development and implementation mechanisms			
Front-line management: Operational actions	Operational actions require the intervention of front-line decision-makers - policy makers, civil servants, entrepreneurs, citizens, researchers and workforce - who are directly responsible for the operationalisation of day-to-day activities linked to tactical and strategic actions			

Source: (Popper et al., 2017).

50 critical factors that informed the ten key aspects and four dimensions of SI. These were used in step 4 and 5 of CASI-F that focused on SI management through the development of over 700 multi-level and multi-actor actions linked to selected critical issues and 46 action roadmaps associated to prioritized actions.

The multi-level and multi-actor advice approach to SI management (Tab. 1) promotes the interaction, interconnectedness and interdependencies of SI actors, thus shifting from the individualist focus to exploring the connections and relationships of stakeholders.

Such approach involved the organisation of 43 pilot studies, whereby innovators co-created 700+ actions to be implemented by multiple actors with different managerial roles and responsibilities.

This article puts emphasis on the final step of CASI-F. A "reality check" from this analysis is then applied to two EU institutional initiatives, namely "EURADA" and the "EBN Innovation Network", as well as two European instruments, "Knowledge Transfer Partnerships" (UK) and the "Entrepreneurship 2020 Action Plan" (Tab. 3). Initiatives' websites and institutional reports were reviewed in order to gain overall understanding of their activities and scope.

The managerial lessons that emerged from the implementation of the CASI-F framework, and, in particular, step five, have been applied as a tool for the assessment of status quo of the initiatives as well as for providing reflections and recommendations on the way forward.

2. The CASI-F approach

The CASI-F journey and its results supported the development of SI related concepts, which can improve the overall understanding, assessment and consequently the management of SI. Regarding the typology of sustainable innovations, and given the growing complexity of societal challenges, it was agreed amongst research organisations involved in the study that a more holistic approach to the assessment of sustainable innovations should take into account a wider range of innovations, which in the context of CASI included product, service, social, organisational, governance, system and marketing innovations. While product, service and social innovations were recognised as most common and prominent amongst studied SI cases, the analysis of organisational, governance, system and marketing

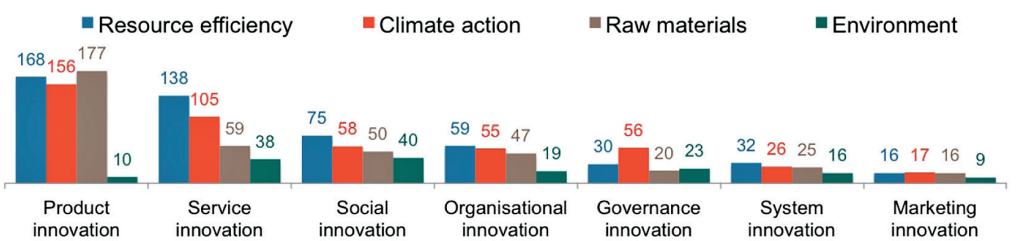

Fig. 2. Distribution of the 548 CASI cases by type of innovation

innovations showed a significant number of initiatives with equally and sometimes more important impacts in some sustainability areas or socio-economic sectors (Fig. 2 and Popper et al., 2017).

The analysis of positive multi-system transformations showed that all types of innovations are equally important for the achievement of desirable environmental, economic, societal, government and infrastructure system impacts, assimilating all seven types of innovations as an integral part of a wider socio-technical system. Finally, it was concluded that a more holistic approach to defining sustainable innovation (SI) should take into account the multiple roles of the quadruple helix of SI stakeholders – government, business, civil society and research and education – as innovators, supporters, sponsors and/or beneficiaries. With this in mind, a more holistic approach to responsible sustainable innovation (RSI) was defined as follows: **Responsible Sustainable Innovation** (RSI) is the result of a smart quadruple helix (S4H) oriented effort supporting the incremental or radical evolution of a socio-technical system based on positive multi-systemic transitions or transformations without compromising the needs, welfare and wellbeing of current and future generations. By multi-systemic transformations we mean environmental, economic, social, government and infrastructure systems while the S4H effort refers to a carefully planned and timely implemented mobilisation and mutual learning process engaging government, business, civil society and research and education stakeholders.

Apart from positive multi-systemic transformations, engaged SI actors believed that a systematic and forward-looking SI assessment should also consider the evaluation of critical issues (e.g. barriers, drivers, opportunities and threats) shaping and affecting the success of SI, in order to better inform managerial decision-making.

The management of SI and related critical issues should also take into account the strategic, tactical and operational nature of required actions. Furthermore, regardless of its type (i.e. process, service, social, organisational, governance, system or marketing), the management of SI should pay careful consideration to the context, people, process and impact dimensions. Finally, the results of the CASI study revealed that SI processes would also benefit from a holistic and sound portfolio of actions or tasks that take into account the ten key aspects of SI management associated to these dimensions, namely: momentum, foresight, resources, mobilisation, aptitude, attitude, catalysts, fosterers, transformations and sustainability (Tab. 2).

3. From roadmaps to meta tasks

Innovators of SI initiatives mapped in CASI were engaged in a mobilisation and roadmap co-creation process aimed to break the chosen action down into smaller tasks/sub-tasks.

Tab. 2. Key management dimensions and aspects

Context dimension	***Momentum*** refers to the force that gets a sustainable innovation moving forward	***Foresight*** refers to the future-oriented strategic drive of a sustainable innovation	***Resources*** refer to the means that can be drawn by a sustainable innovation to be designed, developed implemented and diffused	***Mobilisation*** refers to the capacity to reach and involve key stakeholders
People dimension	***Aptitude*** refers to the actual skill set or competences of people involved in the design, development, implementation and diffusion of a sustainable innovation		***Attitude*** refers to the type of behaviour of people responsible for the design, development, implementation and diffusion of a sustainable innovation	
Process dimension	***Catalysts*** refer to critical factors enabling the design and development phases of a sustainable innovation process		***Fosterers*** refer to critical factors supporting the implementation and diffusion phases of a sustainable innovation process	
Impact dimension	(Multi-agent) ***Transformation*** refers to positive changes in the quadruple helix of SI and knowledge production		(Systemic) ***Sustainability*** refers to changes in the socio-technical system in which the SI operates that lead to positive environmental, social, economic, government and infrastructure transformations	

Source: (Popper et al., 2017).

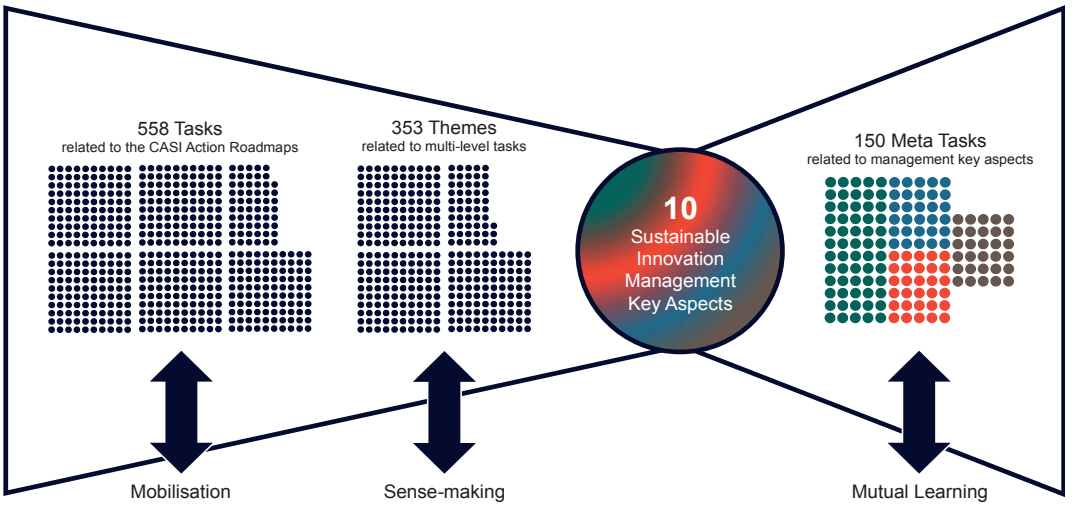

Fig. 3. From tasks to meta-tasks

These sub-tasks addressed ten SI management key aspects related to four SI management dimensions:

- context – momentum, foresight, resources, mobilisation,
- people – aptitude and attitude,
- process – catalysts and fosterers,
- impact – transformation and sustainability.

Mobilisation of innovators in developing action roadmaps resulted with a total of 558 co-created tasks. The collection of tasks was analysed by Inova+ (Anttila, 2016) who conducted a sense-making exercise and identified 353 themes clustered by type of actor (government, business, civil society and research/education) and management levels (strategic, tactical and operational).

To further promote mutual learning, a team from the University of Manchester re-clustered and further analysed the themes in order to arrive to a more manageable and maximum number of 15 meta-tasks per key aspect. As a result a total of 150 meta tasks or lessons from 46 the CASI roadmaps were identified. Fig. 3 illustrates the funnelling process.

The next section presents selected examples of how the afore-mentioned 10 key aspects (with meta-tasks listed in the Appendix of this article) can apply to two EU institutional initiatives, namely "EURADA" and the "EBN Innovation Network", as well as two European instruments, "Knowledge Transfer Partnerships" (UK) and the "Entrepreneurship 2020 Action Plan" (Tab. 3).

Strong commitment towards innovation, oriented towards regional development (especially in the case of EURADA), ability to foster actors' interaction, interest in facilitating knowledge transfer processes (Wynn & Jones, 2017), proved capacity to support entrepreneurs' innovation activities, e.g. the Entrepreneurship 2020 Action Plan (European Commission, 2012), and incubating innovation (EBN, 2017) are some reasons that justify the selection of these cases.

4. Towards a RSI culture in Europe

Although this section does not aim to discuss in detail the application of all meta-tasks to each management aspect, the most relevant ones for each case study are discussed through two specific questions:

- How are EU entities and European instruments actually performing in relation to the discussed SI management aspect?
- What tasks can innovation actors implement in relation to the discussed aspect?

4.1. Momentum

Status quo: To contribute to the momentum EURADA harmonizes the needs of regional agencies with the political context while supporting their interests before EC and other organizations. The EBN innovation network, in turn, assists these European organizations and other national and regional public authorities and agencies in reinforcing European

Tab. 3. Selected case studies

Case studies (EU initiatives) for the application of CASI Meta tasks	
EURADA	"EURADA, the European Association of Economic Development Agencies, was established in 1992. It is an inclusive, Europe-wide network of people working on economic development. It exists to serve the needs of its members: identifying and promoting best practice in economic development, representing members' interests with the European Commission and the key organisations within it or associated with it, helping its members to work more effectively by brokering partnerships and helping to foster cross-border business, and maintaining strong international links outside the European Union to bring global best practice to further enhance the capabilities of its members" (EURADA, 2017)
EBN Innovation Network	"EBN is a network of around 150 quality-certified EU|BICs (business and innovation centres) and 100 other organisations that support the development and growth of innovative entrepreneurs, start-ups and SMEs. EBN is also a community of professionals whose day-to-day work helps these businesses to grow in the most effective, efficient and sustainable way" (EBN, 2017)
Case studies (European instruments) for the application of CASI Meta tasks	
Knowledge Transfer Partnerships (UK)	"The Knowledge Transfer Partnership (KTP) scheme helps businesses to innovate and grow. It does this by linking them with a university and a graduate to work on a specific project. Each KTP is a three-way partnership between a business, an academic institution and a graduate. The academic institution employs the recently-qualified graduate who works at the company. The graduate, known as the "associate", brings new skills and knowledge to the business" (UK Government, 2017)
Entrepreneurship 2020 Action Plan	"The Entrepreneurship 2020 Action Plan is the Commission's answer to challenges brought by the gravest economic crisis in the last 50 years. It is a blueprint for action to unleash Europe's entrepreneurial potential, remove existing obstacles and revolutionize the culture of entrepreneurship in the EU. It aims to ease the creation of new businesses and to create a much more supportive environment for existing entrepreneurs to thrive and grow" (European Commission, 2017)

innovation systems. In the UK, firms utilize the "Knowledge Transfer Partnerships" instrument to foster their research and innovation processes. This tool facilitates and strengthens the cooperation between businesses and academic actors in a context that calls for the creation of start-ups to strengthen research and generate innovation. With respect to entrepreneurial aspects, the Entrepreneurship 2020 Action Plan represents other practical solutions of the European Commission to growth related challenges emerging from the economic crisis.

Way forward: Leveraging existing and favourable momentum and contextual conditions for innovation can enhance social growth and sustainability. This implies undertaking analysis of the innovative firms' competition dynamics, identifying best practices, studying the most efficient management structures, capturing potential investors and learning about potential partnerships and network conditions. Through this exhaustive exploration, firms should identify critical issues and challenges that could eventually justify the modification of initial objectives. In parallel, proactive initiatives in firms may be taken to identify relevant people in politics and envisage impactful and prospective new regulations. Business practices (standards, certificates, tools) should then be reformulated accordingly. Promotional and marketing efforts (which may boost the brand image) have to be complementarily aligned with these initiatives.

4.2. Foresight

Status quo: EURADA informs and updates regional agencies about latest policies and trends. Forward-looking initiatives include the discussion and reflection on upcoming management methods for regional development. The EBN innovation network also provides its members with a broad range of empirical data, practices, trends and management tools. KTP, in relation to long-term plan and future perspectives, encourages the development of joint research (firms and academic actors) the impact of which is to a large extent aligned with socio-technical trends. The Entrepreneurship 2020 Action Plan provides not only knowledge on market trends (Market Monitoring Mechanisms) but also possibilities for experiencing new business models.

Way forward: Future oriented government actions need to be based on an inventory of firms' strategic targets and projects and a scanning activity that helps to detect trends, practices, and opportunities of firms. This baseline information would give stronger sense to innovation policies that are really aligned with business strategies, including the defini-

tion of target groups, potential investors and potential alliances. The innovation policy formulation process should, in parallel, rely on dialogues with leading experts and engage the wider public in decision-making processes. In this respect, it is useful to utilise platforms and tools for communication and collaboration so that involved actors receive feedback on their own policy contribution.

4.3. Resources

Status quo: EURADA's actions for improving innovation are endorsed and supported by 69 regional agencies from 21 countries. The members are regional actors involved in economic development. The EBN innovation network has, among other resources, a platform with a portfolio of 35+ EU-funded projects. The institution has a wide expertise in entrepreneurship, regional development, incubation and innovation. While small to medium-sized firms contribute with a third of the firm-academic actors cooperation costs in the UK's KTP instrument, large firms contribute with half of the costs. The Entrepreneurship 2020 Action Plan shows valuable resources in the existing cooperation between clusters and business networks. This cooperation facilitates networking and exchange of best practices to improve SMEs efficiency.

Way forward: Resources for sustainable innovation need analysing with regards to the geographical coverage and prospective expansion plans, thus taking advantage of the possibility of implementing economics of scale. In addition, by gaining access to data on best European and global practices firms can also utilise information on relevant reference cases that help to map and manage resources and infrastructures. Availability of resources is basically related to the capacity of attracting business partners, investors and collaborators. This is sometimes influenced by the capacity of applying for local/national/EU funding with the right partners (e.g. engaging local citizens and local businesses as partners) and by an appropriate, ethical and fair use of champions and influential actors at the political level.

4.4. Mobilisation

Status quo: EURADA enlarges the capacity of international mobilisation of its members by promoting and brokering partnerships beyond the EC. The institution also fosters an intensive cooperation between its associates. The EBN innovation network, analogously, promotes international connections and assists in the definition of B2B partnerships. KTP induces actors' mobilisation in two directions; namely, it stimulates approaching initiatives of business actors towards the academic environment, and vice versa. To achieve it, the instrument invites firms to establish partnerships with academic institutions and their graduates. From other broader perspective, the European Commission, through the Entrepreneurship 2020 Action Plan contributes to the mobilization of the quadruple helix actors to be engaged in a network that assists the development of new business ideas, provides advice, and offers coaching on how to do business.

Way forward: Mobilisation improves the relationship of firms with policy-makers and investors. Therefore, it demands the identification of relevant actors' existing expansion strategies, the analysis of new stakeholders, the strengthening of existing networks, and the exploration of new training methods. All these requirements call for the development of reliable communication channels. Engaging a wider range of actors in innovation processes (e.g. organising workshops with regional/local stakeholders and citizens) increases the transparency of the decision-making process and raises awareness on sustainability. In addition, mobilisation facilitates knowledge-exchange and contributes to learning about failed practices and success stories.

4.5. Aptitude

Status quo: EURADA shares best practices in the area of local and regional economic development. This encourages members to improve their innovation-oriented initiatives. The institution also assists agencies and firms in the training of staff involved in regional development. The EBN innovation network provides training, peer-review, and professional services for incubators and accelerators. Including researchers in businesses environment through KTP facilitates knowledge transfers as the graduate provides new skills and knowledge to the firm. KTP mobilization lasts between 12 and 36 months. The Entrepreneurship 2020 Action Plan calls for the development of the Erasmus for Young Entrepreneurs programme to enhance competences and e-skills. The Plan organizes capacity building seminars, financed by ESF, that involve young entrepreneurs. Another objective of the Plan is to enhance cooperation within MS thus improving entrepreneurship education schemes in each country.

Way forward: Good practices on sustainable innovation require a varied set of competences. Some critical skills refer to the ability to understand and encourage more foresightful culture into organizations and institutions, develop effective leadership, and undertake different types of negotiation in various political contexts. It is also highly valuable to have a good understanding of the actual impact of the innovation. Creativity is an underlying feature that always exists behind processes, which objectives relate to innovation, regardless of the type of innovation such processes aim to address. These competences are usually the result of accumulating knowledge acquired from stakeholders and partners, hence the importance of identifying correct contact points for relevant innovation actors, facilitating internal knowledge sharing (e.g. away days), promote external knowledge exchange (e.g. study visits) thus encouraging mutual motivation among team members. Implementing systematic evaluation systems in the institution would make easier and more effective the matching of tasks with personal competences.

4.6. Attitude

Status quo: Encouraging and promoting knowledge circulation, for example, becomes a source of motivation and positive attitude for EURADA members. Sharing best practices actually stimulates agencies in their process of achieving more effective regional management and defining more precise and impactful development agendas. EBN, in addition, encourages co-working and participatory process within the innovation network. The KTP process enables researchers to provide new scientific leadership and research motivation to the firms where they are integrated. The Entrepreneurship 2020 Action Plan, in turn, activates best practices exchange and promotes the action of senior executive mentors. In particular, they consider as highly relevant the exchange of young entrepreneurs. Recently, the Plan has formulated initiatives to attract migrant entrepreneurs.

Way forward: Communicating and clarifying the vision of the organization to the staff is a first step to achieve people's commitment with the objectives and to promote cost-savings and quality-improvement spirit. In addition, it also contributes, together with the implementation of incentives for personal engagement, to creating an innovation culture grounded in social responsibility rationales, increase understanding of end-users and customer needs, and foster optimism, engagement and collaboration. Externally, it is notably important to engage high-profile people as ambassadors and mentors in disseminating facts on positive impacts of the innovation. Similarly, top managers can be involved in attitude-changing campaigns, and nurturing dialogue between employees and local community may have in key stakeholders' attitude. External recognition of this sort would also facilitate effective recruitment processes that guarantee the incorporation of people who are passionate about the cause.

4.7. Catalysts

Status quo: EURADA stimulates and accelerates innovation processes at regional level by enabling the cooperation of its members with the EC and other European institutions. EBN networking and assisting processes also contribute to the development of innovation processes through high-level events, conferences and workshops. A supporting element of KTP is the utilization of advisers that review the feasibility of projects and help firms to find academics or researchers that may be involved in the exchange programme. The Entrepreneurship 2020 Action Plan aims to consolidate partnerships within the Enterprise Europe Network thus becoming an effective instrument for spreading information on EU initiatives, finance, and innovation practices.

Way forward: Funding is a catalyst of innovation processes. In this respect, innovators may be tempted to apply for multiple sources of funding and organize crowd-funding campaigns. Funding sources are more effectively achievable when the process involves key business partners in research activities, includes new actors at different stages,defines educational material on the innovation's impacts, and conducts pilots/testing exercises with specific groups so as to reveal the actual impact of the innovation. The latter frequently implies the elaboration of ex ante evaluation of the innovation process. Launching an innovation process and getting an early and appropriate operational pace require the identification of scalability challenges (and reacting accordingly) and the introduction of learning-by-doing methods to deepen knowledge. Initiating cooperation and taking part of communication networks (e.g. through the involvement of local and national media) would also help innovators to reach larger audiences.

4.8. Fosterers

Status quo: EURADA analyses the know-how needs of the members so that knowledge exchange can be better promoted and the network efficiency reinforced. The EBN network, in turn, promotes benchmarking and continuous support of its members towards strategic aspects of innovation. Through the KTP, UK firms get academic support and expertise that eventually accelerate R&D. The process thus helps businesses to be more competitive and productive in terms of innovation. The Entrepreneurship 2020 Action Plan encourages the implementation of mechanisms that facilitate the creation of start-ups within universities and business creation in general. To foster innovation, the Plan also aims to reduce the administrative and regulatory burdens.

Way forward: Continuous dialogue and communication are essential to foster innovation. Some elements of this dialogue are the incorporation of experts in the innovation process (engaging them in relevant social research or political discussions), a continuous interaction with end-users, and the organization of networking activities. In these dialogues strategic actions would include the dissemination of best practices that highlight the environmental, social and economic impact, and the communication of re-investment plans that guarantee a continuous and sustainable innovation improvement. Other strategic aspects that foster sustainable innovation are based on the systematic identification and analysis of critical issues. This practice supports the generation of strategic, tactical and operational actions, the realisation of which may be eventually translated into mid- and long-term action roadmaps.

4.9. Transformation

Status quo: The EBN network helps innovative start-ups and entrepreneurs in reinforcing their innovation operations and eventually transforming regional and local economies. KTP strategies support job creation, which constitutes an important expression of socio-economic transformation. In fact, around 60% of researchers get a permanent job in the company where they collaborate. The Entrepreneurship 2020 Action Plan may be understood as a strategy to deploy Europe's innovation strength. Economic transformation is thus represented by the elimination of barriers to research and innovation and by the implementation of a culture of entrepreneurship.

Way forward: There are numerous parameters that can be utilised to measure and assess the impact of innovation. Some economic ones include job creation, promotion and setting up of spin offs, creation of knowledge-based products and services, emergence of new economic players, or promotion of entrepreneurship and innovations skills. Socially, we may recognise impacts of innovation processes in the raising of community spirit and young people's engagement or in the promotion of positive cultural and behavioural change. At environmental level, innovation may be useful to engage multiple actors in sustainability oriented visioning and to induce paradigm shifting on sustainability problems. A culture of innovation also supports success sustainability stories in targeted geographical areas.

4.10. Sustainability

Status quo: EURADA promotes the sustainability of their members' operations by seeking and proposing new modalities of funding. This strategy is essential to ensure the availability of innovation projects. The EBN innovation network also makes use of appropriate certifications that assure and maintain the quality standards of the member organizations. The potential for sustainability of KTP is given, for example, by the research outcomes. Along the exchange programme the academic partner produces on average more than three research projects and two papers. The Entrepreneurship 2020 Action Plan sets up measures for broadening markets for European enterprises, while mapping new opportunities for innovative firms.

Way forward: Guarantying the positive effects of innovation requires the broadening of firms' networks and a proactive collaboration with local stakeholders. Impact is also favoured by the identification of critical markets in need for further sustainable innovation, and by the detection of new ways to encourage cost savings. In this sense, a smart allocation of resources should also be a key part of cost oriented decisions and sustainability strategies. These strategies include self-sustainable sustainability campaigns and initiatives that encourage public engagement. From another perspective, we have to highlight the importance of implementing indicators and targets that help to focus on adequate environmental priorities and goals. The use of indicators, which is part of impact assessment activities, would be in addition more precise and efficient if actors are supported by proper sustainability management advice.

Conclusions

Mapping sustainable innovation initiatives and exploring their nature and characteristics can improve the understanding of concepts underpinning the assessment and management of SI. The systematic analysis of SI management actions prioritised by innovators involved in the CASI Pilot Study helped to identify 15 meta-tasks for each of the ten management key aspects framing the CASI-F roadmaps. The application of these meta-tasks to EU initiatives and European instruments of innovation proves to be a useful tool towards assessing the status quo of these initiatives and providing reflections on the way forward. Furthermore, it suggests that CASI-F can support a more responsible sustainable innovation (RSI) assessment and management culture in Europe and demonstrates the importance of following practices that inform responsible sustainable innovation policies. While this paper has helped to highlight that selected European cases are undertaking activities aligned with the ten management key aspects of SI, a more systematic study of national and cross-national initiatives, programmes and strategies would be needed in order to further position a responsible sustainable innovation (RSI) assessment and management culture in Europe.

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Appendix

Tab. 1. List of 150 sustainable innovation management metatasks

MOMENTUM		**RESOURCES**	
1.	Analyse competition	36.	Engage local citizens and local businesses as partners
2.	Analyse existing training programmes	37.	Evaluate and improve education material
3.	Analyse top-level and strategic management structures	38.	Expand geographical coverage with economics of scale
4.	Benchmark communication channels by target group	39.	Explore crowdfunding opportunities and innovation contests
5.	Create guidelines for industries	40.	Facilitate internal knowledge-exchange
6.	Gain senior management buy-in	41.	Gain access to data on best European and global practices
7.	Identify and study best practices and state of art of the field	42.	Generate information on relevant reference cases
8.	Identify critical issues and challenges	43.	Identify and monitor existing relevant databases
9.	Identify high objectives for project impact	44.	Include funding opportunities into concept development
10.	Identify new/relevant partnerships, networks, and investors	45.	Map and manage resources (e.g. limiting target groups)
11.	Identify relevant people and regulations in politics	**MOBILISATION**	
12.	Identify relevant structures and frameworks	46.	Conduct pilots encouraging sustainable values
13.	Improve business practices (standards, certificates, tools)	47.	Create multimedia content and social media campaigns
14.	Organise site visits	48.	Develop real-time communication channels
15.	Strengthen promotional/marketing channels (brand image)	49.	Engage in knowledge-exchange with similar projects
FORESIGHT		50.	Engage regional and local stakeholders
16.	Conduct inventory of strategic targets and projects	51.	Find advocates by launching competitions
17.	Create an internal and external communication strategy	52.	Gain internal support from management
18.	Differentiate “buzzes” from trends	53.	Identify existing expansion strategies
19.	Develop staff expertise and knowledge on future trends	54.	Identify new stakeholders and strengthen existing networks
20.	Engage into existing dialogue on topic with leading experts	55.	Identify training needs and develop new training methods
21.	Engage the public in decision-making processes	56.	Improve the relationship with policymakers and investors
22.	Explore platforms/tools for communication and collaboration	57.	Increase the transparency in the decision-making process
23.	Identify emerging business models, trends and innovations	58.	Organise workshops and roadshows to increase awareness
24.	Identify mutual objectives with other actors	59.	Promote public participation and citizen engagement
25.	Identify new target groups, potential investors and alliances	60.	Seek endorsements, references and success stories
26.	Monitor events, news, articles and conferences	**APTITUDE**	
27.	Organise brainstorm sessions to identify new ideas	61.	Accumulate knowledge with stakeholders and partners
28.	Scan the horizon for trends, practices and opportunities	62.	Adapt to different contexts, e.g. language, environment
29.	Set strategic objectives/activities	63.	Attract strategic partners and use public participation
30.	Set up umbrella organisations to deal with market changes	64.	Create exciting educational/training material (for trainers)
RESOURCES		65.	Develop critical skills (foresight, leadership, negotiation)
31.	Apply for local/national/EU funding with the right partners	66.	Educate public on the impact of the innovation
32.	Attract business partners, investors and collaborators	67.	Enable internal knowledge sharing (e.g. away days)
33.	Choose a spokesperson and lobby for resources	68.	Enable external knowledge exchange (e.g. study visits)
34.	Conduct an inventory of infrastructure needs	69.	Encourage mutual motivation among team members
35.	Develop infrastructures for monitoring and marketing	70.	Engage administrators/managers in critical issues mapping

APTITUDE		**FOSTERERS**	
71.	Engage stakeholders in innovation and idea generation	111.	Develop and upgrade innovation by engaging in research
72.	Foster creativity, research skills and networking	112.	Engage experts in creating the teaching materials
73.	Identify correct contact points for stakeholders	113.	Engage into relevant social research or political discussions
74.	Implement systematic evaluation system	114.	Ensure continuous dialogue with end-users
75.	Matching correct people with correct tasks	115.	Exploit the best existing bottom-up processes
ATTITUDE		116.	Highlight the environmental, social and economic impact
76.	Create an innovation culture with social responsibility	117.	Implement systematic management of critical issues
77.	Disseminate facts on positive impacts of the innovation	118.	Improve communication and dissemination plans
78.	Encourage enthusiasm and commitment to learn	119.	Promote ex post evaluation of impact and excellence
79.	Engage high-profile people as ambassadors and mentors	120.	Re-invest the savings gained for continuous improvement
80.	Foster interpersonal and communication skills	**TRANSFORMATION**	
81.	Foster optimism, engagement and collaboration	121.	Consolidate emerging players and promote spin-offs
82.	Increase understanding of customer needs and end-users	122.	Create knowledge-based products and services
83.	Involve staff in PR activities to clarify the company vision	123.	Create targeted campaigns on the impact
84.	Involve top managers in attitude-changing campaigns	124.	Engage multi-actors visioning and paradigm shifting
85.	Implement incentives for personnel engagement	125.	Foster sustainability in targeted geographical areas
86.	Nurture dialogue between employees and local community	126.	Foster transferability between different sectors
87.	Promote cost-savings and quality-improvement spirit	127.	Gather positive socio-economic and environmental stories
88.	Recruit people passionate about the cause	128.	Increase community sense and young people engagement
89.	Train ambassadors for the cause internally and externally	129.	Promote entrepreneurship and innovations skills
90.	Use several methods/tools to measure satisfaction	130.	Promote positive cultural and behavioural change
CATALYSTS		131.	Provide user-friendly information to stakeholders
91.	Apply for multiple sources of funding	132.	Refocus goals and priorities based on impact assessment
92.	Collaborate with local and national media	133.	Support the development of competences and skills
93.	Conduct ex ante evaluation of the innovation process	134.	Use innovative marketing to promote sustainable lifestyles
94.	Conduct pilots and testing with specific target groups	135.	Use job creation as measurement of impact
95.	Identify scalability challenges and react accordingly	**SUSTAINABILITY**	
96.	Initiate cooperation and networks to reach larger audience	136.	Allocate resources to support sustainable innovations
97.	Introduce learning-by-doing methods to deepen knowledge	137.	Create self-sustainable sustainability campaigns
98.	Involve employees and stakeholders in testing	138.	Develop green and social solutions in rural and urban areas
99.	Involve key business partners in research activities	139.	Develop transparent public engagement strategies
100.	Involve new actors at different stages of the process	140.	Emphasise the economic, social and environmental impacts
101.	Launch educational material on the innovation's impacts	141.	Expand the network and collaborate with local stakeholders
102.	Launch targeted PR and communication campaigns	142.	Identify critical markets in need for sustainable innovations
103.	Organise crowdfunding campaigns	143.	Identify new ways to encourage cost and energy savings
104.	Segment shareholders into groups	144.	Implement new regulations and incentives for sustainability
105.	Use bottom-up processes in the development phase	145.	Share knowledge on green firms, products and services
FOSTERERS		146.	Push for wider use of sustainability indicators and targets
106.	Apply for funding opportunities and programmes	147.	Refocus priorities and goals based on impact assessment
107.	Attend and organise networking activities	148.	Seek sustainability assessment and management advice
108.	Build collaboration practice with employees and partners	149.	Share sustainability best practices and infrastructures
109.	Create good practices, FAQ and guidelines for employees	150.	Support increasing deployment of sustainable services
110.	Create incentives for ambassadors and citizens		