

# CASI-F

COMMON FRAMEWORK FOR  
THE ASSESSMENT  
AND MANAGEMENT OF  
SUSTAINABLE INNOVATION



Mobilisation and Mutual  
Learning (MML) Action Plans:  
Mainstreaming Science in  
Society Actions in Research



This project has received funding from the European Union's Seventh Framework Programme for Research, Technological Development and Demonstration under grant agreement no 612113.

Organisation responsible for the deliverable  
**UNIMAN**

Authors:

**Rafael Popper**  
**Guillermo Velasco**

The University of Manchester

**Monika Popper**  
Futures Diamond

Date of delivery  
2017

**Project start date:**  
January 2014

**Duration:**  
42 months

**Coordinating organisation:**  
ARC Fund - Applied Research and Communications Fund,  
Bulgaria

**Dissemination level:**  
Public

### **How to cite this report**

Popper, R., Velasco, G. and Popper, M. (2017). CASI-F: Common Framework for the Assessment and Management of Sustainable Innovation, CASI project report. Deliverable 6.2.

### **Corresponding author**

Rafael.Popper@manchester.ac.uk

### **Important note**

In order to further increase the impact and outreach of CASI-F, the authors have agreed to publish several verbatim extracts of Section 5 of this report as part of Chapter 3 of the following CASI Annual Policy report edited by The University of Manchester:

- Popper, R. and Velasco, G. (eds.) (2017). Sustainable Innovation Policy Advice, CASI project report. Deliverable 7.2.

ISBN: 978-0-946007-34-9

© European Union, 2017

Photos: ©Shutterstock, ©Freepik, ©Unsplash

Reproduction permitted, provided the source is acknowledged. The contents of this publication do not necessarily reflect the position or opinion of the European Commission. Neither the European Commission nor any person acting on its behalf is responsible for the use that may be made of the information contained in this publication or for any errors that may remain in the texts, despite the care taken in preparing them.

The information in this document is provided as is and no guarantee or warranty is given that the information is fit for any particular purpose. The user thereof uses the information at its sole risk and liability. Neither the European Commission nor any person acting on behalf of the Commission is responsible for the use that might be made of the following information.

© CASI 2017. Reproduction is authorised provided the source is acknowledged.

# List of CASI partners

ARC FUND



## PP1/ARC Fund

Applied Research and Communications Fund  
5 Alexander Zhendov St  
Sofia 1113  
Bulgaria  
T +359 2 973 3000  
WWW.ARCFUND.NET



## PP2/CUE

Coventry University Enterprises Limited  
Priory Street  
Coventry, United Kingdom  
CV1 5FB  
T +44 (0) 24 7688 7688  
WWW.COVENTRY.AC.UK



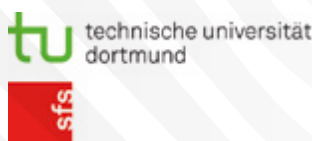
## PP3/DBT

Danish Board of Technology Foundation  
Toldbodgade 12  
DK - 1253 København K  
Denmark  
T +45 33 32 05 03  
WWW.TEKNO.DK



## PP4/UH

University of Helsinki  
P. O. Box 40 (Unioninkatu 40)  
FI-00014 Helsingin yliopisto  
T +358 294 1911  
HTTP://WWW.HELSINKI.FI



## PP5/TUdo

Sozialforschungsstelle Dortmund  
Evingerplatz 17  
44339 Dortmund  
Germany  
T +49 231 8596-0  
WWW.SFS-DORTMUND.DE



## PP6/UP

University of Primorska  
Titov trg 4  
6000 Koper / Capodistria  
Slovenia  
T +386 56 117523  
WWW.UPR.SI



## PP7/PSTP

Poznan Science and Technology Park  
ul. Rubież 46  
61-612 Poznań  
Wielkopolska  
Poland  
T +48 61 827 97 00  
WWW.FUNDACJA.PPNT.POZNAN.PL

## PP8/INOVA+

Inova+  
Centro de Inovação de Matosinhos  
Rua Dr. Afonso Cordeiro, 567  
4450-007 Matosinhos  
Portugal  
T +351 229 397 130  
WWW.INOVAMATOSINHOS.EU



## PP9/META

META Group S.r.l.  
Italy  
T +39 07 44 24 82 20  
WWW.META-GROUP.COM

## PP10/INCREASE TIME SA

Increase Time SA  
Rua Dr. Afonso Cordeiro, 877  
Sala 201  
4450-007 Matosinhos  
Portugal  
T +351 229 396 355  
WWW.INCREASETIME.PT/



## PP11/COMUNE DI MONZA

Municipality of Monza  
Piazza Trento e Trieste  
20900 Monza  
Italy  
T +39 39 23721  
WWW.COMUNE.MONZA.IT



## PP12/MUNICIPIO DE ESPINHO

Câmara Municipal de Espinho  
Praça Dr. José Oliveira Salvador  
Apartado 700  
4501-901 Espinho  
Portugal  
T +351 227 335 800  
WWW.PORTAL.CM-ESPINHO.PT



## PP13/ZSI

Centre For Social Innovation Ltd  
Linke Wienzeile 246  
A-1150 Wien  
Austria  
T +43 1 495 0442  
WWW.ZSI.AT



## PP14/UNIMB

Università degli Studi di Milano-Bicocca  
Piazza dell'Ateneo Nuovo, 1  
20126 Milano, Italy  
T +39 2 6448 1



## PP15/Cleantech Bulgaria

Cleantech Bulgaria  
15 Svetlostroi St., entr. A  
Sofia 1111  
Bulgaria  
T +359 888 256123  
WWW.CLEANTECH.BG



## PP16/UNIMAN

The University of Manchester  
Oxford Road  
Manchester M13 9PL  
United Kingdom  
T +44 161 306 6000  
WWW.MANCHESTER.AC.UK



## PP17/KU Leuven

KU Leuven  
Oude Markt 13  
Bus 5005 3000 Leuven  
Belgium  
T +32 16 32 40 10  
WWW.KULEUVEN.BE



## PP18/TL

TechnoLogica  
46 Chervenastena St  
1421 Sofia  
Bulgaria  
T +359 2 91912  
WWW.TECHNOLOGICA.COM



## PP19/FD

Futures Diamond, s. r. o.  
Plzeňská 98  
150 00 Prague 5  
Czech Republic  
T +44 75 211 38154  
WWW.FUTURESDIAMOND.COM

# Table of Contents

|                                                                                      |           |
|--------------------------------------------------------------------------------------|-----------|
| List of CASI-F based R&I policy agendas for SI                                       | 5         |
| List of Figures                                                                      | 5         |
| List of Tables                                                                       | 5         |
| List of Mobilisation and Mutual Learning Boxes                                       | 5         |
| List of Mobilisation and Mutual Learning Interviews on CASI-F                        | 6         |
| List of CASI-F Tool Boxes                                                            | 6         |
| List of SI Assessment Boxes                                                          | 6         |
| List of SI Management Boxes                                                          | 6         |
| List of Acronyms                                                                     | 7         |
| About the Authors                                                                    | 8         |
| Acknowledgements                                                                     | 9         |
| Foreword                                                                             | 11        |
| Preface                                                                              | 12        |
| <br>                                                                                 |           |
| <b>1. The CASI-F report</b>                                                          | <b>13</b> |
| <b>2. The CASI project</b>                                                           | <b>14</b> |
| <b>3. CASI-F introduction</b>                                                        | <b>15</b> |
| • 3.1. Why?                                                                          | 15        |
| • 3.2. What?                                                                         | 15        |
| • 3.3. How?                                                                          | 17        |
| <b>4. CASI-F principles</b>                                                          | <b>19</b> |
| • 4.1. CASI-F principle of responsible governance                                    | 20        |
| • 4.2. CASI-F principle of practical advice orientation                              | 21        |
| • 4.3. CASI-F principle of multiple sources of knowledge                             | 23        |
| • 4.4. CASI-F principle of multi-level perspectives and transitions                  | 24        |
| • 4.5. CASI-F principle of multi-systemic sustainability assessment and management   | 25        |
| <b>5. CASI-F methodology</b>                                                         | <b>27</b> |
| • 5.1. Step 1: CASI-F protocols and tools for sustainability relevance and scanning  | 27        |
| • 5.2. Step 2: CASI-F protocols and tools for multi-criteria analysis and assessment | 30        |
| • 5.3. Step 3: CASI-F protocols and tools for critical issue analysis and assessment | 32        |
| • 5.4. Step 4: CASI-F protocols and tools for multi-level advice management          | 35        |
| • 5.5. Step 5: CASI-F protocols and tools for action roadmaps management             | 37        |
| <b>6. CASI-F in action</b>                                                           | <b>44</b> |
| • 6.1. CASI-F assisting sustainability transitions of 'product innovations'          | 46        |
| • 6.2. CASI-F assisting sustainability transitions of 'service innovations'          | 48        |
| • 6.3. CASI-F assisting sustainability transitions of 'social innovations'           | 50        |
| • 6.4. CASI-F assisting sustainability transitions of 'organisational innovations'   | 52        |
| • 6.5. CASI-F assisting sustainability transitions of 'governance innovations'       | 54        |
| • 6.6. CASI-F assisting sustainability transitions of 'system innovations'           | 56        |
| • 6.7. CASI-F assisting sustainability transitions of 'marketing innovations'        | 58        |
| <b>7. CASI-F impacts and benefits</b>                                                | <b>60</b> |
| • 7.1. Impacts of CASI-F                                                             | 60        |
| • 7.2. Benefits of CASI-F                                                            | 61        |
| <b>8. CASI-F key achievements, H2020 relevance and the way forward</b>               | <b>64</b> |
| • 8.1. Key achievements                                                              | 64        |
| • 8.2. H2020 relevance                                                               | 65        |
| • 8.3. The way forward                                                               | 65        |
| <b>9. CASI-F Glossary</b>                                                            | <b>66</b> |
| <b>10. References</b>                                                                | <b>72</b> |
| <b>11. Annexes</b>                                                                   | <b>74</b> |
| • 11.1. Annexe 1: CASI project work packages and tasks structure                     | 75        |
| • 11.2. Annexe 2: CASI-F driven R&I policy agendas for SI                            | 77        |
| • 11.3. Annexe 3: Visualising CASI-F                                                 | 87        |
| • 11.4. Annexe 4: Visualising CASIPEDIA                                              | 88        |
| • 11.5. Annexe 5: CASI-F benefits and impacts                                        | 89        |

## List of CASI-F based R&I policy agendas for SI

|                                                                                        |    |
|----------------------------------------------------------------------------------------|----|
| SI Agenda 1: Strengthening eco-community empathy and crowd-funded development          | 77 |
| SI Agenda 2: Developing sustainable urban and rural infrastructures for the bioeconomy | 78 |
| SI Agenda 3: Deploying responsible environmental and resource-efficiency strategies    | 79 |
| SI Agenda 4: Creating sustainable bio-fuel and renewable energy solutions              | 80 |
| SI Agenda 5: Promoting foresight for sustainability governance and intelligence        | 81 |
| SI Agenda 6: Advancing recycling and circular use of waste and raw materials           | 82 |
| SI Agenda 7: Embedding sustainability in cultural and holistic education models        | 83 |
| SI Agenda 8: Fostering eco-local-agriculture and bio-resources efficiency              | 84 |
| SI Agenda 9: Implementing sustainable transport and smart mobility innovations         | 85 |
| SI Agenda 10: Dealing with climate issues and managing greenhouse gas emissions        | 86 |

## List of Figures

|                                                                                             |    |
|---------------------------------------------------------------------------------------------|----|
| Figure 1: CASI-F overview                                                                   | 17 |
| Figure 2: CASI-F Sustainability Cube                                                        | 20 |
| Figure 3: CASI-F assisted Socio-technical System Transitions                                | 24 |
| Figure 4: CASI-F assessment of multi-systemic sustainability                                | 26 |
| Figure 5: CASI-F assessment of critical issues from the CASI Ideas Bank                     | 33 |
| Figure 6: CASI-F multi-perspective logics in the analysis of critical issues                | 33 |
| Figure 7: CASI-F approach to multi-stakeholder and multiple SI management dimension mapping | 40 |
| Figure 8: CASI-F approach to SI management key aspect mapping                               | 41 |
| Figure 9: CASI-F approach to SI management dimension by implementation time frame           | 41 |
| Figure 10: CASI-F SI Pilots section in the CASI Portal                                      | 45 |

## List of Tables

|                                                                                                            |    |
|------------------------------------------------------------------------------------------------------------|----|
| Table 1: CASI-F alignment with responsible governance principles                                           | 20 |
| Table 2: CASI-F alignment with the RACER criteria of the EC Impact Assessment Guidelines                   | 21 |
| Table 3: CASI-F sources of knowledge and strategic intelligence                                            | 23 |
| Table 4: CASI-F use of EC priorities in climate action, environment, resource efficiency and raw materials | 28 |
| Table 5: CASI-F use of International Standard Industrial Classification of Economic Activities             | 29 |
| Table 6: CASI-F criteria for the fully-fledged assessment of sustainable innovations                       | 31 |
| Table 7: CASI-F approach to multi-level and multi-stakeholder advice                                       | 36 |
| Table 8: CASI-F approach to SI management dimensions and key aspects                                       | 39 |
| Table 9: CASI-F approach to multi-level and multi-stakeholder actions mapping from 43 innovations          | 40 |
| Table 10: CASI-F benefits by type of stakeholder                                                           | 61 |

## List of Mobilisation and Mutual Learning Boxes

|                                                                     |    |
|---------------------------------------------------------------------|----|
| MML Box 1: On the CASI definition of Sustainable Innovation         | 16 |
| MML Box 2: On the holistic nature of CASI-F                         | 19 |
| MML Box 3: On CASIPEDIA                                             | 22 |
| MML Box 4: On the strengths of CASI-F                               | 24 |
| MML Box 5: On sustainability relevance and scanning                 | 28 |
| MML Box 6: On multi-stakeholder perspectives                        | 34 |
| MML Box 7: On multi-level advice                                    | 36 |
| MML Box 8: On how CASI-F complements quantitative SI assessments    | 38 |
| MML Box 9: On action roadmaps                                       | 42 |
| MML Box 10: On the added value of CASI-F for research and education | 63 |

## List of Mobilisation and Mutual Learning Interviews on CASI-F

|                                                                                              |    |
|----------------------------------------------------------------------------------------------|----|
| MML Interview on CASI-F benefits and impacts from a CASI partner's perspective               | 89 |
| MML Interview on CASI-F benefits and impacts from a CASI country correspondent's perspective | 91 |
| MML Interview on CASI-F benefits and impacts from an innovator's perspective                 | 92 |

## List of CASI-F Tool Boxes

|                                                                    |    |
|--------------------------------------------------------------------|----|
| Tool Box 1: CASI-F tool for sustainability relevance and scanning  | 30 |
| Tool Box 2: CASI-F tool for multi-criteria analysis and assessment | 32 |
| Tool Box 3: CASI-F tool for critical issue analysis and assessment | 35 |
| Tool Box 4: CASI-F tool for multi-level advice management          | 37 |
| Tool Box 5: CASI-F tool for action roadmaps management             | 43 |

## List of SI Assessment Boxes

|                                                                                                 |    |
|-------------------------------------------------------------------------------------------------|----|
| SI Assessment Box 1: CASI-F for 'product innovation' assessment: WAI (SP)                       | 46 |
| SI Assessment Box 2: CASI-F for 'service innovation' assessment: RUSZ Reparatur (AT)            | 48 |
| SI Assessment Box 3: CASI-F for 'social innovation' assessment: Transition Now (DK)             | 50 |
| SI Assessment Box 4: CASI-F for 'organisational innovation' assessment: Tempo al Tempo (IT)     | 52 |
| SI Assessment Box 5: CASI-F for 'governance innovation' assessment: Innovation Fur (DK)         | 54 |
| SI Assessment Box 6: CASI-F for 'system innovation' assessment: Passive House Kindergarten (BG) | 56 |
| SI Assessment Box 7: CASI-F for 'marketing innovation' assessment: ECOverified (GR)             | 58 |

## List of SI Management Boxes

|                                                                                                 |    |
|-------------------------------------------------------------------------------------------------|----|
| SI Management Box 1: CASI-F for 'product innovation' management: WAI (SP)                       | 46 |
| SI Management Box 2: CASI-F for 'service innovation' management: R.U.S.Z Reparatur (AT)         | 48 |
| SI Management Box 3: CASI-F for 'service innovation' management: Transition Now (DK)            | 50 |
| SI Management Box 4: CASI-F for 'organisational innovation' management: Tempo al Tempo (IT)     | 52 |
| SI Management Box 5: CASI-F for 'governance innovation' management: Innovation Fur (DK)         | 54 |
| SI Management Box 6: CASI-F for 'system innovation' management: Passive House Kindergarten (BG) | 56 |
| SI Management Box 7: CASI-F for 'marketing innovation' management: ECOverified (GR)             | 58 |

# List of Acronyms

|             |                                                                                            |
|-------------|--------------------------------------------------------------------------------------------|
| • AT        | Austria                                                                                    |
| • BE        | Belgium                                                                                    |
| • BG        | Bulgaria                                                                                   |
| • CASI-F    | CASI Framework                                                                             |
| • CASIPEDIA | State-of-the-Art of Sustainable Innovation (online database)                               |
| • CC        | Country Correspondents                                                                     |
| • CE        | Circular Economy                                                                           |
| • CEC       | Citizens-Experts-Citizens                                                                  |
| • CZ        | Czech Republic                                                                             |
| • DE        | Germany                                                                                    |
| • DK        | Denmark                                                                                    |
| • EEA       | European Environmental Agency                                                              |
| • EC        | European Commission                                                                        |
| • EU        | European Union                                                                             |
| • FD        | Futures Diamond                                                                            |
| • FI        | Finland                                                                                    |
| • FP7       | EC Seventh Framework Programme for Research and Technological Development                  |
| • H2020     | Horizon 2020                                                                               |
| • ICT       | Information and Communication Technologies                                                 |
| • ISO       | International Organization for Standardization                                             |
| • IT        | Italy                                                                                      |
| • JRC       | Joint Research Centre                                                                      |
| • MIOIR     | Manchester Institute of Innovation Research                                                |
| • MML       | Mobilisation and Mutual Learning                                                           |
| • N/A       | Not Available                                                                              |
| • PL        | Poland                                                                                     |
| • PR        | Public Relations                                                                           |
| • PT        | Portugal                                                                                   |
| • R&I       | Research and Innovation                                                                    |
| • RES       | Renewable Energy Sources                                                                   |
| • RRI       | Responsible Research and Innovation                                                        |
| • RTDI      | Research, Technology Development and Innovation                                            |
| • SCS       | Societal Challenge 5 on Climate Action, Environment, Resource Efficiency and Raw Materials |
| • SI        | Sustainable Innovation                                                                     |
| • SiS       | Science in Society                                                                         |
| • SL        | Slovenia                                                                                   |
| • SMART     | Specific, Measurable, Assignable, Realistic, Time-related                                  |
| • SMEs      | Small and Medium Enterprises                                                               |
| • STI       | Science, Technology and Innovation                                                         |
| • UNIMAN    | The University of Manchester                                                               |
| • UK        | United Kingdom                                                                             |
| • VTT       | Technical Research Centre of Finland                                                       |
| • WP        | Work package                                                                               |

## About the Authors

**Rafael Popper** (PhD) is Principal Scientist in Foresight, Organizational Dynamics and Systemic Change at VTT Technical Research Centre of Finland, and Research Fellow at the Manchester Institute of Innovation Research (MIOIR) of the University of Manchester, where he completed his PhD on 21st Century Foresight. He is also Director of Executive Education in Foresight and Horizon Scanning at the Manchester Business School (MBS); Innovation Director and CEO of Futures Diamond in the UK and the Czech Republic; and has been Director of iKnow (an Innovation, Foresight and Horizon Scanning System) and Leader of the Mapping activities of the European Foresight Platform (EFP). His main areas of work include: 'foresight' as an instrument of innovation policy, the development of foresight and horizon scanning methodology, and the design of forward-looking activities and their evaluation with a focus on technological and social innovation policies. He is an economist from the Central University of Venezuela (UCV) and he has also worked as Research Fellow at the United Nations Industrial Development Organisation (UNIDO) based in the Area Science Park of Trieste in Italy. At UNIDO, Dr Popper was responsible for the Technology Foresight Programme for Latin America and the Caribbean (UNIDO TF-LAC) and for actively supporting the Technology Foresight Programme for Central and Eastern Europe and Newly Independent States (UNIDO TF-CEE/NIS). In the CASI project Dr Popper leads the work package on the 'State-of-the-art of Sustainable Innovation' and several tasks including: Draft proposal of Common Framework for Assessment and Management of Sustainable Innovation (CASI-F); Revision and finalisation of CASI-F; Preparation of an Annual Policy Report on SI and the Online training for the application of CASI-F (aka CASI Tutorial).

**Guillermo Velasco** (PhD) works as a researcher at the Manchester Institute of Innovation Research, where he has completed his PhD in the field of Strategic Intelligence for Innovation policies. His research interests relate to future-based anticipatory methods, policy recommendations formulation and critical discourse analysis. He is currently analysing how forward-looking activities may lead to more consistent policy advice. He holds a BEng in Industrial Economics from the Technical University of Madrid (UPM), and an MPhil in Economics and Innovation Management from UPM and EU-SPRI. He has experience in the creative industries, as Director of Innovation, and has been actively involved in product innovation conception and development, IPR and brand management, and 'design thinking' corporate assessment. He has also worked as an Industrial Organization advisor in Spain and Sweden. He participates in several European Commission-funded projects, such as providing information on the future of ERA (VERA project), and developing a common framework for the management of sustainable innovation (CASI), as well as in other Horizon scanning initiatives, sponsored by the UK NHS, to identify new technologies and models of care. Guillermo also collaborates as a Master Executive Lecturer of Internationalisation Strategies for the European University of Madrid. In the CASI project he has contributed to numerous tasks, including: the mapping of sustainable innovations; the design and piloting of CASI-F; the editing of an Annual Policy Report and the CASI Tutorial.

**Monika Popper** (MSc) is COO and Senior Project Manager at Futures Diamond, a research and technology development company based in the UK and the Czech Republic. She plays a pivotal role in the management of activities and people involved in process/product/service/social innovations and related ICT-systems supporting foresight, horizon scanning and other research and policy processes. After completing her BSc (Honours) in Environmental Health Monika continued her postgraduate studies within the MSc on Healthcare Management programme of the Manchester Business School. She has been involved in the organisation of various stakeholder engagement activities and the preparation of policy briefs on health and safety, food security and sustainable innovation (SI), including review of developments and implementation of SME policies, among other research activities. In recent years she has worked in the area of innovation assessment and management: mapping critical issues affecting the entrepreneurship environment and decisions of social and technological innovations in several European countries and collaborating with innovators and other relevant stakeholders to create growth, competitiveness and the sustainability of the innovations. In the CASI project she leads the 'Communication and dissemination' work package and provides ICT support to all work packages through Futures Diamond's mapping environment and proprietary content management system (Diamond Frame), which are the backbone of CASIPEDIA, the CASI Tutorial, CASI Blog, Policy Watch activities and CASI-F tools described in this report.

# Acknowledgements

Over a very intense period of 40 months, the authors of this report have developed CASI-F in the context of the CASI project on 'Public Participation in Developing a Common Framework for Assessment and Management of Sustainable Innovation', which received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under the grant agreement number 612113. During this period the authors have benefited from the valuable support of several European Commission officials, especially **Giuseppe Borsalino** (CASI Project Officer and responsible for Public and Multi-Actor Engagement in the Directorate General for Research and Innovation - DG R&I) and **Josefina Enfedaque** (Policy Officer at the Sustainable Management of Natural Resources Unit, DG R&I).

In addition, this work is partly the result of a continuous process of mobilisation and mutual learning (MML) involving 19 partners from 12 EU countries and a network of experts (country correspondents) in the remaining 16 countries, thus ensuring a full coverage of the EU28. While the authors have been leading the main work packages (WP2 and WP10) and activities (Tasks 4.2, 6.2 and 9.1) that brought CASI-F to its current or 'final' shape (see Annexe 1), the evolution and 'bullet-proofing' of the framework would not have been possible without the valuable contributions, feedback and (often) provocative debates between colleagues from the following partnering organisations: **Applied Research and Communications Fund** (BG), **Coventry University Enterprises** (UK), **Danish Board of Technology** (DK), **Consumer Society Research Centre at the University of Helsinki** (FI), **Technical University of Dortmund** (DE), **University of Primorska** (SL), **Poznan Science and Technology Park of Adam Mickiewicz University Foundation** (PL), **INOVA+** (PT), **META Group** (IT), **Increase Time** (PT), **Municipality of Monza** (IT), **Espinho City Council** (PT), **Centre for Social Innovation** (AT), **University of Milano-Bicocca** (IT), **Cleantech Bulgaria** (BG), **Manchester Institute of Innovation Research of the University of Manchester** (UK), **Catholic University of Leuven** (BE), **TechnoLogica** (BG) and **Futures Diamond** (CZ). Equally important was the commitment and hard work of the CASI country correspondents: **Marika Rošā** (Latvia), **Merit Tatar** (Estonia), **Antonis Zorpas** (Cyprus), **Sébastien Soleille** (France), **Warren Phelan** (Ireland), **Yuliya Voytenko** (Sweden), **Frans Coenen** (Netherlands), **Foteini Psarra** (Greece), **Brian Restall** (Malta), **Dolores Ordoñez Martínez** (Spain), **Olga Mala** (Luxembourg), **Edgaras Leichteris** (Lithuania), **Cristian-Marius Moisoiu** (Romania), **Geist Radovan** (Slovakia), **Erdős Katalin** (Hungary) and **Račić Domagoj** (Croatia). Their input was particularly important for the SI assessment activities (aka Steps 1-3 of CASI-F, see Section 5), especially for the co-creation and enrichment of the CASIPEDIA bank of SI.

Similarly, for their continuous engagement, efforts and mutually beneficial collaboration during the mapping process (SI assessment) and the pilot study (SI management-oriented), we deeply appreciate and thank innovators from: Austria (**Arche Noah, RUSZ, Social Festival, Solar Taxi**), Belgium (**Content, Energybook**), Bulgaria (**AHA Car, M Cube, Passive Kindergarten, 3D Ecobus**), Czech Republic (**KOKOZA, REKOLA, Let's Clean up Czech Republic**), Denmark (**Cities, BioTrans System, Innovation Fur, Transition Now**), Finland (**Cleaning day, Climate Doctor, District Cooling, Kutsuplus**), Germany (**Fifty/Fifty School, GT VET – Greening Technical Vocational Education and Training, Dorf-ist-Energie(klug), Stromsparcheck**), Greece (**ECOverified**), Italy (**Sharing Torino, Tempo al Tempo, Food Bank Network**), Poland (**PPNT Gdynia, PEKA, Promotional Forest Complex, JuraPark**), Portugal (**Hydro Efficiency, Lightning Living, Rivers Project, Bussaco Digital**), Slovenia (**EcoSchool, Ponika, Toring**), Spain (**WAI**), and UK (**Location Independent Working, Engineering and Computing building**). Of course, special thanks go to the CASI teams from **Coventry University Enterprises** (UK) and **Technical University of Dortmund** (DE) for leading the piloting of the multi-level advice management activities (aka **Step 4 of CASI-F**) and to **INOVA+** (PT) for leading the implementation of the action roadmaps management work (aka **Step 5 of CASI-F**).

Throughout the project we also received valuable support and advice from: sustainability and innovation experts - **Veronica Sanchez Romaguera, Jakob Edler, Ian Miles, Jonathan Pinkse and Rainer Walz**; an internal Advisory Board - **Attila Havas, Claire Nauwelaers, and Philine Warnke**; an external **Advisory Committee** - **Cristina Chiotan, Marlen Arnold and Bill Wadsworth**; an external Evaluator - **Mahshid Sotoudeh**; and all the participants at CASI Mutual Learning events (i.e. Mutual Learning Seminars, Citizen Panels, Expert Workshops, Stakeholder Workshops, Policy Dialogue) in 12 EU countries. Furthermore, we would like to thank other co-authors - **Joe Ravetz, Effie Amanatidou, Maria Schwarz-Woelzl, Zoya Damianova, Ventseslav Kozarev** - of the Draft CASI-F (CASI Deliverable 4.2), which, although structurally and content-wise different from this report, helped to trigger several mutual learning processes that informed the revision and finalisation of CASI-F. Likewise, the authors are grateful to **Catarina Azevedo** and **Marta Pinto** from Inova+ for their professional attitude and commitment to the implementation of WP6 (on the management of sustainable innovation), as well as for understanding that the completion of this report had to wait until all 43 pilots were successfully executed and analysed.

Special thanks for the much-needed inspiration, motivation and support that kept the authors of this report going through the typical ups and downs of a research journey go to: **Ian Miles** (Professor of Technological Innovation and Social Change at the University of Manchester) and **Tiina Pajula** (Principal Scientist in Sustainability Assessment at VTT Technical Research Centre of Finland) for the Foreword, their insightful, independent and inspiring appraisal on the future potential of CASI-F, as well as for their feedback on the R&I policy agendas on SI (Annexe 2); to **Kamila Dobek** and **Małgorzata Piotrowicz** (Researchers at the Poznan Science and Technology Park), who facilitated the promotion of CASI-F by visualising the main features of the framework and CASIPEDIA with the help of a Graphic Designer **Judyta Dąbrowska** (see Annexes 3 and 4); to **Lukáš Dohnal** (Senior Technology Developer at Futures Diamond) who, together with authors, played a key role in the technical implementation of the CASI-F tools and showed endless commitment to the demanding agenda of CASI; to **Anita Tregner-Mlinarić** (Senior EU Project and Business Development Manager at Meta Group) for being a continuous source of motivation throughout the CASI project; to **Frances Brown** for proofreading the report and confirming its logical structure, readability and content clarity; and to the growing number of engaged stakeholders reporting on the benefits and impacts of CASI-F (see also Annexe 5), including: **Mattia Martini** and **Giorgio Beltrami** (Researcher and lecturer at the University of Milano-Bicocca), who promoted and facilitated the uptake of CASI-F among Masters course students by building their capacity and ‘infecting’ them with the right attitude to engage in a crowd-sourcing activity, using and applying CASI-F to support the assessment and management of real SI initiatives; **Edgaras Leichteris** (CASI Country Correspondent for Lithuania), who has been actively promoting the CASI-F methodology as a practical multi-level governance solution facilitating multi-stakeholder engagement; and **Antonios Lygidakis** (Co-founder of the ECOverified case piloted by CASI), among others.

Finally, we would like to express our sincere gratitude to influential policy and research actors who helped us increase the outreach of CASI-F, at national and EU levels. In particular, we thank **Miroslava Kopicová** (Director of the National Training Fund and Former Minister of Education of the Czech Republic), who strongly believed in the work at the early stages of CASI-F, provided a relevant policy perspective and supported MML aspects of the CASI project; and **Robbert Fisher** (Managing Director of JIIP – Joint Institute for Innovation Policy) for endorsing CASI-F at the end of its journey by inviting us to a couple of proposals to the European Environmental Agency (EEA) and Horizon 2020 calls. If successful, these would allow the authors to continue working on some of the ideas presented in Section 8.3 on **the way forward**.

# Foreword



**Ian Miles**  
**Professor of Technological  
Innovation and Social Change**  
**Manchester Institute of  
Innovation Research,  
Manchester Business School,  
The University of Manchester**

'Sustainable innovation' brings together two complex terms. 'Innovation' can refer to the process of creating something new, or the novel thing itself. For the innovative activity or object to be 'sustainable', it needs to be itself embedded in a web of practices and flows that enable its persistence. But of course we are particularly interested in innovative products that themselves contribute to social and environmental sustainability, and processes of innovation that move us on to more trajectories that are more sustainable in this sense. As pressures to achieve this grow, so each sense of sustainability is liable to reinforce the other – for an innovation to be sustainable, it will need to support sustainability. This simple formulation, however, points to a complex set of issues. How are judgements of sustainability to be brought into decisions and designs, into development and dissemination, of innovation?

CASI-F represents a framework that is intended to help us navigate these tricky matters. Now, of course, there are already numerous tools and sustainability assessment frameworks, with over 80 ISO standards alone. Following a thorough literature review of these existing frameworks (see Saurat et al., 2015; Lopez et al., 2015; Pihkola et al., 2016a, Pihkola et al., 2016b and Section 4.5), there was seen to be a need to complement existing sustainability frameworks with an approach that is more forward-looking and action-oriented, focusing specifically on increasing the sustainability of innovation/innovation processes. The complementarity of CASI-F cannot be over-emphasised. Its future use would benefit from additionally building in a step incorporating ISO sustainability standards and quantitative assessment methods and tools (such as Life Cycle Assessment) – either as a preliminary task, or as a cross-cutting activity complementing all the steps of CASI-F (see Section 8.3). This is needed to avoid narrowing the use of CASI-F as a mainly ameliorative tool, employed to increase the sustainability of 'unsustainable' innovations (i.e. those which may prove to be profitable, but have negative environmental and/or societal impacts).



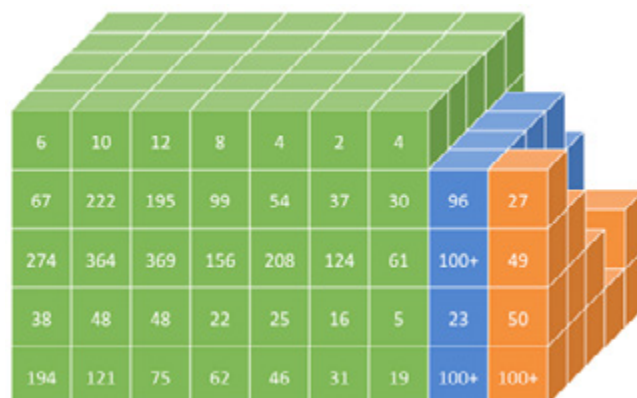
**Tiina Pajula**  
**Principal Scientist in  
Sustainability Assessment**  
**VTT Technical Research Centre  
of Finland**

The three axes of the proposed '**Sustainability Cube**' help explain the approach (Figure 2). **Axis 1** extends the conventional 'triple bottom line' (environment, economy, society) with two additional transformation areas (government and infrastructure systems). **Axis 2** allows us to take account of the diversity of innovations, focusing on seven types of innovation (Track 1). These seven types emerge at the niche level, and may impact on the regime and landscape levels – using the terminology and analysis developed in the (socio-technical system) transition management perspective. This allows for the assessment of evolving policy issues shaping the regime – across all EU28 countries, with 100+ Policy Briefs produced (Track 2). Finally, **Axis 3** integrates the aspirations and visions of citizens through structured public engagement and mutual learning facilitated by a citizen-expert-citizen process that helped to identify research priorities (Track 3). **Axis 3** of the cube illustrates CASI-F in action (involving five steps); the key figures, discussed in Section 5 of this report, reflect the considerable volume of work conducted in the course of the CASI project.

As this report demonstrates, CASI-F has succeeded in engaging, mobilising and promoting mutual learning across a wide range of stakeholders, particularly including innovative actors in government, business, civil society, and research and education. The approach encouraged and empowered them to take the driving seat in the process – to produce their own action roadmaps to address the critical issues they themselves identified. In this sense, CASI-F, as a methodology, is already potentially self-sustainable: the know-how is already transferred, and we shall consider what actions will encourage its further use and embedding. Now the CASI team is harvesting success stories that are being 'organically' embedded in education and capacity-building courses associated with the project, such as the CASI Tutorial, a Masters programme in the University of Milano-Bicocca and the executive education course on foresight and horizon scanning at the University of Manchester, where students and participants are using CASI-F protocols and tools to structure and conduct their sustainable innovation case studies. Finally, we would like to mention one way in which the work on CASI-F has contributed to explicating some of the features that underlie the complexity of the topic of sustainable innovation. The process of developing CASI-F, involving the identification and assessment of more than 500 SI cases, also explored the sustainability goals (short-medium-to-long-term) pursued by innovators. This by-product of the project, identifying 10 distinct agendas for Research and Innovation policy, is itself a result that many readers may find of interest. The agendas range from proposing initiatives in specific fields (e.g. Agenda 8 concerns the fostering of 'eco-local-agriculture' and efficiency in the production and use of bio-resources) to more generic perspectives on policy-making (e.g. promotion of greater foresight and use of sustainability governance and intelligence). Full details of the agendas, and their relations to priorities in H2020 and in citizen perspectives, are presented in Annexe 2 of this report.

# Preface

Back in 2014, right after the CASI kick-off meeting, my then five-year-old son Samuel was building a wooden block construction when still at nursery. The bigger and taller it grew, the more interested his peers became in knocking it down. They tried approaching it several times, plotting an attack strategy, running and jumping around, trying hard to succeed. Finally, in the face of repeated attacks and challenging behaviour, my son stood his ground, exclaiming: "If you break my construction I am going to make it bigger!!!"



*Building CASI-F as Europe's next generation 'Sustainability Toolbox'*



**Rafael Popper**  
(Sammy's Dad)

**Director of Executive Education in Foresight and Horizon Scanning**

Manchester Institute of Innovation Research, Manchester Business School, The University of Manchester

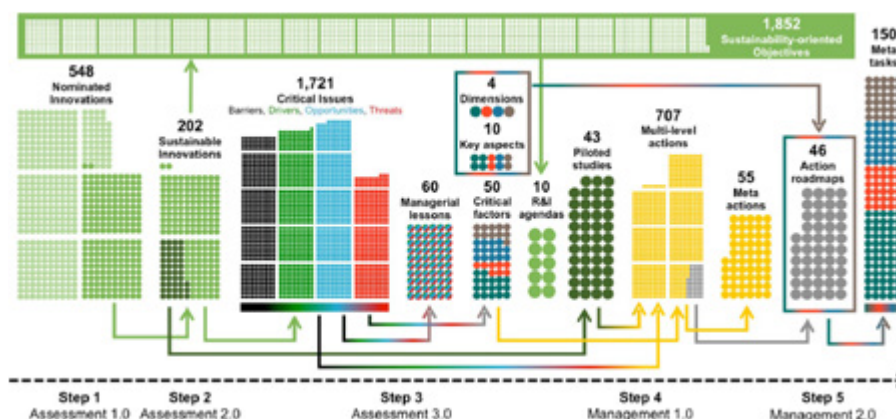
&

**Principal Scientist in Foresight, Organisational Dynamics and Systemic Change**

VTT Technical Research Centre of Finland

The CASI-F journey was a not an easy undertaking. Confronted with the challenges that are somehow intrinsic to sustainability and innovation concepts and practice, and the inevitable obstacles one can encounter when conducting a collaborative action research study, we have carefully assessed and managed all critical issues that came our way and kept on moving forward. After all, meaningful, long-lasting and sustainable results are often stronger when they grow outside of one's comfort zone.

While almost anything in life is perfectible, CASI-F is now finalised and we feel its building blocks are made of bricks. Thus, we are not worried about 'wolves' trying to huff, puff and blow the CASI-F away. In fact, the growing number of impacts, achievements and endorsements we have been discovering, receiving and witnessing throughout the project simply demonstrates that the sustainable commitment that the extended CASI family has shown towards CASI-F is paying off.



This report marks the final contractual stop of the CASI-F journey. Yet, at the same time highlights the way forward and the potential for a new sustainability assessment and management framework (CASI-F) to thrive beyond the life of the project. Moreover, to further advance the uptake of CASI-F in Europe and the world, a free online training course on 'Sustainable Innovation Assessment and Management: Widening Horizons on climate action, environment, resource efficiency and raw materials'

was developed and organised around 6 Modules and 12 Units promoting mobilisation and mutual learning in sustainable innovation and related topics.

The course is available at <http://www.casi2020.eu/tutorial/>

# 1. The CASI-F report

This report has been compiled to meet the objectives of Work Package 6 (WP6), namely the Management of Sustainable Innovation, and in particular Task 6.2 that focuses on the 'Revision and Finalisation of CASI-F' (Common Framework for Assessment and Management of Sustainable Innovation).

The final version of the CASI-F, as presented in this report, was informed by a number of preceding tasks and includes inputs from seminars and workshops with a wide range of societal stakeholders, as well as recommendations and feedback gathered from innovators during the mapping of sustainable innovation (SI) initiatives and piloting of CASI-F implementation. The testimonies of stakeholders are therefore presented within the report, in order to further validate the versatility, usefulness and effectiveness of CASI-F, as perceived by its users. After a brief description of the CASI project in Section 2, Section 3 discusses CASI-F in terms of the basic 'why', 'what', and 'how' questions. Section 4 introduces some five underlying principles of CASI-F (principle of responsible governance, principle of practical advice orientation, principle of multiple sources of knowledge, principle of multi-level perspectives and transitions, and principle of multi-systemic sustainability assessment) applied to all three CASI-F tracks, i.e. innovations, policies and aspirations.

Section 5 presents the core of the CASI-F methodology, consisting of five mutually reinforcing sets of protocols and tools (or steps) that constitute the framework, namely:

- *(Step 1) sustainability relevance and scanning,*
- *(Step 2) multi-criteria analysis and assessment,*
- *(Step 3) critical issue analysis and assessment,*
- *(Step 4) multi-level advice management, and*
- *(Step 5) action roadmaps management.*

While all five steps apply to the above-mentioned three tracks, with protocols and tools adapted to fit the needs of each track, Section 5 will focus on the first track of CASI-F (innovations), which was fully piloted and can be supported with practical examples of the application of CASI-F. Section 6 provides these examples as strong evidence of CASI-F in action being a powerful mobilisation and mutual learning tool. To back up the claim of CASI-F versatility, the section includes examples of its application to support the assessment and management of critical issues in seven selected product, service, social, organisational, governance, system and marketing innovations from the 43 SI cases used to pilot CASI-F.

Section 7 discusses the current and potential impacts of CASI-F in terms of promotion and deployment of the framework, as well as the benefits of CASI-F for government, business, civil society and research and education actors. The report concludes with some final remarks in Section 8 highlighting the key achievements, H2020 relevance and the way forward for CASI-F.





## 2. The CASI project

*For more information please visit: [www.casi2020.eu](http://www.casi2020.eu)*

The CASI project ('Public participation in Developing a Common Framework for Assessment and Management of Sustainable Innovation') aims to respond to one of the Grand Challenges set out in the Horizon 2020 programme of the European Union, namely 'Climate action, environment resource efficiency and raw materials'. It represents an EU-wide cross-sectoral partnership on innovation-related challenges and considers not only the impacts of social and technological innovation, but also the types of actors involved and their inherent interests. It thus effectively integrates the perspectives of civil society, SMEs, industry, policy stakeholders and leading academics.

CASI is based on the understanding of innovation as a key driver of societal progress in the age of technology and of imminent uncertainties about the future. Sustainable innovation further enhances this understanding by introducing sustainability as a focal core of the innovation process and as an objective of innovation diffusion through social and market opportunities. At the same time, this is not an attempt to introduce yet another distinctive type of innovation. Rather, CASI fosters a debate on conceptual dimensions, policy boundaries and good practices, combining innovative pursuits with sustainability objectives.

A collaboration among partners investigates the scope of sustainable innovation as a societal phenomenon and enables the elaboration of an assessment and management framework for sustainable innovation practices, based on a sound conceptual framework and a shared understanding of sustainability in innovation processes among stakeholders. CASI further explores the impacts of innovative practices, as well as of specific technological and social innovations, vis-à-vis the persisting challenges of climate change and resource depletion, and the societal effects thereof. Thus, it makes a thorough inquiry into the balance between the social, economic and environmental impacts of innovations, and helps determine the scope and priorities for national and EU policy-making.

CASI is supported by the Science in Society Programme of FP7, Theme SiS.2013.1.2-1 'Mobilisation and Mutual Learning (MML) Action Plans: mainstreaming Science in Society actions in research'. It is coordinated by the Applied Research and Communications Fund (ARC Fund), a Bulgarian non-governmental policy and innovation research institute. The project's consortium includes 19 partner organisations from 12 EU countries and relies on an extended network of national experts in the remaining 16 countries not represented in the consortium, in order to ensure coverage and inquiry in every EU member state.

# 3. CASI-F introduction

## 3.1. Why?

The trend of wider societal engagement gained particular prominence and importance in 2013 within the 7th Framework Programme (FP7) of the European Commission, and was further reinforced via the succeeding Horizon 2020 Framework Programme for Research and Innovation (2014-2020). With the implementation of Horizon 2020 projects, a wide range of societal stakeholders, including the general public, is being involved and actively participating in Science, Technology and Innovation (STI) activities responding to one of the seven Societal Challenges defined by the EC and listed in Horizon 2020. In the context of the CASI project the participatory solutions aim to address the sustainability aspects of the 5th EU Societal Challenge on Climate Action, Environment, Resource Efficiency and Raw Materials (SC5), while supporting the assessment of sustainable innovation as spelled out in the second specific challenge of the Mobilising and Mutual Learning Action Plans (MMLAP) topics, listed in the Science in Society call for proposals of the Capacities Work Programme 2013. Furthermore, CASI was proposed within the context of the Europe 2020 Strategy; therefore it also embraces the aspirations to achieve smart, sustainable and inclusive growth, taking account of the economic, social and environmental aspects of sustainability.

While stimulating wider societal engagement is currently one of the main objectives in European policy-making, incorporating public concerns, interests and needs into the CASI-F-related formulation and validation activities were of particular importance to the project, in order to ensure the suitability, versatility and applicability of the framework to multiple contexts and actors.

## 3.2. What?

Over 42 months, between 2014 and 2017, the CASI project has created and piloted a common framework (CASI-F) for the assessment and management of SI together with practitioners, including experts, innovators, policy-makers and civil society actors. The framework supports multi-stakeholder engagement in a participatory, evidence-based and forward-looking strategic analysis of critical issues related to sustainable innovations addressing SC5. CASI-F is the result of a research and technology demonstration process, based on an extensive and comprehensive analysis of 500+ case studies, 40+ pilots with innovators, participatory workshops and focus groups, supported by desk research and knowledge crowd-sourcing strategies enabled by web-based tools, for the systematic assessment and management of sustainable innovation.

Overall, CASI-F was envisaged as a holistic tool to support forward-looking decision-making at strategic, tactical and operational levels for government, business, civil society and research and education actors. Moreover, CASI-F is a living 'knowledge co-creation, co-assessment and co-management tool' aiming to improve the economic, social and environmental sustainability of the following seven types of innovations: product, service, social, organisational, governance, system and marketing.

It should be noted that CASI-F complements but does not replace other mainstream frameworks (see Pope et al., 2004; Singh et al., 2011; Ness et al., 2007; Gasparatos et al., 2008; Hacking and Guthrie, 2007; Hansen et al., 2009), such as life cycle assessment, eco-efficiency, eco-design, footprint analyses, etc. While other tools and frameworks measure and assess quantitative sustainability-related indicators, CASI-F sets out to assess and manage the more intangible, yet equally important, aspects pertinent to sustainable innovation with a view to assisting or enabling future socio-technical system transitions.

The prime objective of the CASI project is to develop a common framework for the assessment and management of sustainable innovation, hereinafter referred to as CASI-F. While having such a sharp 10-word objective seems like a straightforward starting point, the reality is that there is plenty of ambiguity in the terms 'common', 'framework', 'assessment', 'management', 'sustainable' and 'innovation'.

What is the meaning of 'sustainable', 'innovation' or 'sustainable innovation'? By definition, 'sustainable' is an adjective for maintaining 'something' at a certain rate or level, while 'innovation' is a noun referring to the outcome or process of doing 'new things'. Putting these two definitions together would make 'sustainable innovation' anything that maintains the outcome or process of doing new things at a certain rate or level. However, such a definition does not specify the kind of 'new things' considered or the rate and type of changes to be maintained. For this reason, and to combine both scholarly and participatory approaches to defining 'sustainable innovation', the CASI project undertook a systematic literature review of the use of the term across all EU28 countries and beyond, complemented by a stakeholder survey gathering 1 500+ responses, and the systematic review of 500+ sustainability-oriented innovations, in order to develop the following working definition: "Sustainable Innovation is any incremental or radical change in a socio-technical system (including social, service, product, governance, organisational, system and marketing solutions) leading to positive environmental, economic and social transformations without compromising the needs, welfare and wellbeing of current and future generations" (Popper et al., 2016).



Overall, based on the aggregated feedback from participants of CASI Mutual Learning Seminars organized in 12 EU countries, it was largely concluded that the:

*“added value of CASI’s definition of sustainable innovation lies in that it provides more clarity and precision to current definitions and understanding of SI. Generally it was agreed upon by participants that the definition covers all relevant dimensions of SI and incorporates the necessary specification/detaillisation.”*

*“CASI definition of SI was considered very solid as it is based on a robust inductive approach based on sound research, mapping, and integrative analysis. In particular, a shared sentiment by key actors was that the definition developed in CASI could be further promoted for integration into EU funding programmes in the post-2020 strategic period in order to provide evidence-based guidelines for sustainability and inform EU-wide expenditure in the areas of transport, climate, agriculture, regional development, and so on.”*

Source: (Ivanov et al., 2016)

#### MML Box 1: On the CASI definition of Sustainable Innovation

The terms ‘assessment’ and ‘management’ denote very clear sets of complementary activities. In the context of the CASI project a five-step approach was employed and focused on:

1. **sustainability relevance and scanning:** identifying ‘innovations’, ‘policies’ and ‘aspirations’ relevant to the societal challenge of ‘climate action, environment, resource efficiency and raw materials’ at national and EU levels;
2. **multi-criteria analysis and assessment:** selecting or prioritising nominated innovations, policies and aspirations using a set of criteria relevant to the aforementioned societal challenge and the mobilisation and mutual learning nature of CASI;
3. **critical issue analysis and assessment:** analysing selected innovations, policies and aspirations so as to identify and prioritise critical issues, such as barriers, drivers, opportunities and threats;
4. **multi-level advice management:** generating and prioritising multi-level and multi-stakeholder actions to manage prioritised critical issues; and
5. **action roadmaps management:** developing roadmaps for the most important and urgent actions.

The main purpose of the assessment and management activities in CASI was to promote adaptation and improve the resilience of the quadruple helix actors (business, government, civil society, research/education) to incremental or radical changes in the socio-technical systems in which the SI initiatives studied operate.

The term ‘common’ is often understood in two different ways. It could refer to something that is ordinary, routine or typical, in which case there would be nothing new to be developed by CASI; or to something that is done or shared by two or more (groups of) actors. The latter interpretation was the obvious choice for CASI-F, which implied the mobilisation of multiple actors during its creation, piloting and wider use.

The word ‘framework’ could mean a set of physical or virtual platforms (tools) around which something is developed, or a system of ontologies, methods and procedures (protocols) to inform and support decision-making. To choose one of these options was neither possible nor suitable for CASI-F, as both sets of practical tools and guiding protocols were needed. As a result, CASI-F consists of several web-based interconnected ‘tools’, including CASIPEDIA (a ‘Mapping Environment’ supporting the analysis of SI cases in terms of SI practices, SI outcomes and SI players), an Ideas Bank, Policy Briefs Bank, Visions Bank and an Actions/Roadmaps Bank, supported by a set of interconnected ‘protocols’ for the assessment and management of SI initiatives.

This duality of CASI-F is similar to that of the Microsoft Office or the Adobe Suite packages, which include a group of complementary applications and tools, providing templates or functionalities for specific data gathering, access, processing and visualisation activities (protocols). While the CASI-F protocols were developed in the context of the state-of-the-art activities of the CASI project, the online tools were basically adapted from existing ICT systems and solutions (i.e. FD’s mapping environment and Diamond Frame) supporting research and innovation activities.

More specifically, this report demonstrates the application and usefulness of a framework that supports the assessment and management of sustainable innovations, policies and aspirations (three tracks of CASI-F). This support is based on a conwved data collection) to intelligence 2.0 (systematic data analysis) to intelligence 3.0 (strategic actions and advice). These types of intelligence will serve, at the end of the report, to illustrate the sort of benefits that CASI-F may provide to every kind of SI actor.

### WHY IS CASI-F 'COMMON'?

- It has been developed through the participation of multiple actors: innovators, citizens, experts and partners
- It has been conceived and endorsed through multi-stakeholder mobilisation and mutual learning and piloting processes
- It is embedded in the CASI platform and uses a shared set of protocols and tools

### WHY IS CASI-F A 'FRAMEWORK'?

- It has provided a shared conceptual model or principles within CASI
- It has provided a shared working model or methodology within CASI
- It enables SI actors to utilise the principles and methodology – protocols and tools – in their SI related own initiatives

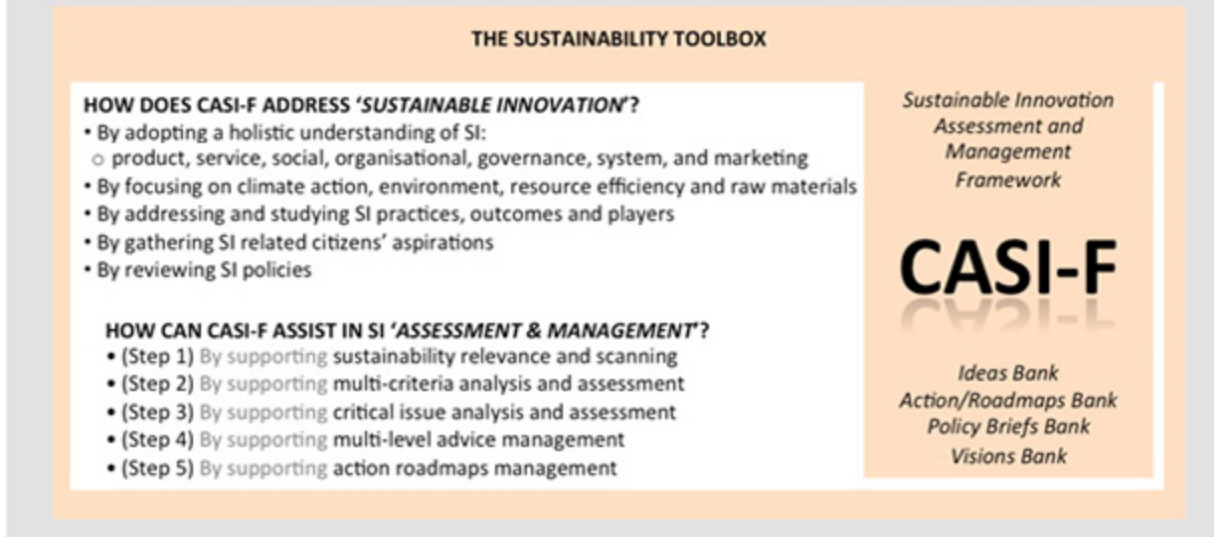


Figure 1: CASI-F Overview

## 3.3. How?

CASI-F was developed as part of a mobilisation and mutual learning agenda including CASI partners, country correspondents and a wide range of external stakeholders involved in various project activities, such as the CASI SI pilots, workshops and mutual learning events, interviews and questionnaires. More specifically, the interlinkages of Task 6.2 (Revision and Finalization of the CASI Framework) with other tasks and work packages include:

### WP2 (see Annexe 1 for a list of work package names and tasks) – The development of CASI-F began and involved state-of-the-art research and innovation in the domain of SCS, following a literature review and documentary analysis of sustainable innovation definitions, frameworks, initiatives and relevant stakeholders, in order to establish a conceptual theoretical framework laying the foundations for remaining CASI-F developments (see Popper et al., 2016), including those of WP2. These involved:

1. Nominating 500+ sustainable innovation cases from across Europe and beyond;
2. Mapping the practices, outcomes and players of 200+ cases;
3. First draft of a working definition of sustainable innovation.

**WP3 – Additional reactions regarding CASI-F and related protocols and tools were gathered during 12 national CASI Mutual Learning Seminars**, the objectives of which were to raise awareness of sustainable innovations, to share knowledge, reach a working agreement on the concept of SI as promoted by CASI and to generate new knowledge through interaction and discussions among the different stakeholder groups. For the purpose of this report, participants' feedback and suggestions were concluded in Deliverable 3.2 (see Ivanov et al., 2016) and regarded:

1. Validation of the definition of 'sustainable innovation' produced in Deliverable 2.1;
2. Validation of the benefits of the CASIPEDIA database produced in WP2;
3. Validation of the main CASI-F features as drafted in Deliverable 4.2.
4. during 12 national CASI Mutual Learning Seminars, the objectives of which were to raise awareness of sustainable innovations, to share knowledge, reach a working agreement on the concept of SI as promoted by CASI and to generate new knowledge through interaction and discussions among the different stakeholder groups. For the purpose of this report, participants' feedback and suggestions were concluded in Deliverable 3.2 (see Ivanov et al., 2016) and regarded:

**WP4 – The CASI-F draft was further discussed and validated during a series of workshops that involved CASI's country correspondents**, as well as a number of stakeholders in 12 EU countries, whose feedback (see Schwarz-Woelzl et al., 2016) was used to inform the final structure of CASI-F. The 12 workshops were conducted with the objective of generating feedback on the overall concept and approach of CASI-F from different stakeholders' perspectives. They focused mainly on gathering feedback and opinions on:

1. *Overall strengths and weaknesses of the CASI-F;*
2. *Whether the CASI-F tool could support the assessment and management of SI, moving it forward, and why;*
3. *Whether CASI-F could support the stakeholders participating in the workshop in their job with regard to sustainability and sustainable innovation, and why;*
4. *Any concerns related to the CASI-F draft;*
5. *Open questions and comments on the CASI-F draft;*
6. *Most important lessons related to the CASI Framework and its first draft.*

**WP5 – CASI-F was thoroughly piloted, involving over 40 innovators** in the assessment and prioritisation of critical issues related to their SI and identified during the mapping process, as well as in the formulation of actions (see Martin and Avarello, 2016; Schultze et al., 2016). The pilot was also used to validate the applicability of the framework to technological and social types of innovation, considering the specific characteristics of both. Twelve CASI partnering countries carried out the CASI-F pilot jointly with the innovators, which resulted in a total of 43 piloted cases. This supported the:

1. *Validation of SI initiative assessment in CASIPEDIA;*
2. *Revision of critical issues (i.e. barriers, drivers, opportunities and threats);*
3. *Definition of potential actions at three levels of management (i.e. strategic, tactical and operational) and consideration of four stakeholders' perspectives (government, business, civil society and research and education actors), considering critical issues and the assessment of SI cases for the definition of actions supporting the management of SI;*
4. *Assessment of actions by level of importance, feasibility and impact (environmental, social and economic);*
5. *Identification of actions for the development of elaborated action roadmaps;*
6. *Meta-actions based on clustering of the actions identified by the innovators.*

**WP6 – Action roadmaps (see Anttila, 2016), with sub-tasks planned and structured around 10 key management aspects**, were co-produced with innovators in order to address previously identified critical issues, thus supporting better management of sustainable innovations. These led to the following outcomes:

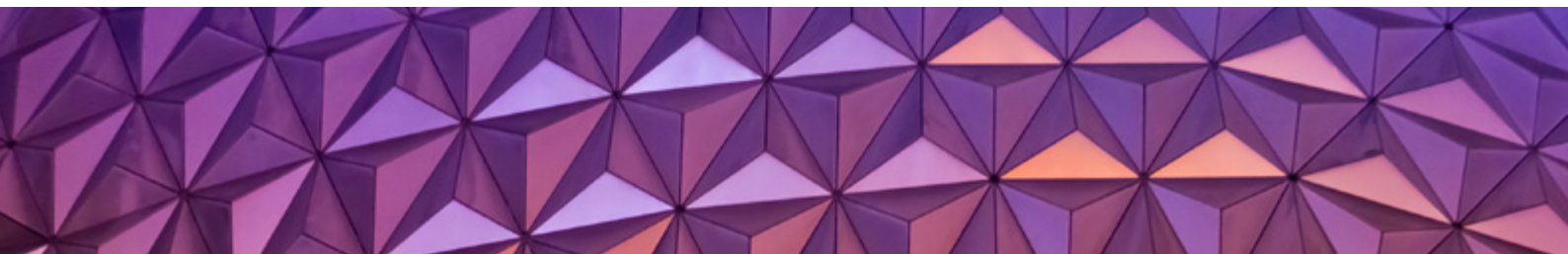
1. *46 actionable roadmaps;*
2. *Interviews on the implementation of CASI-F conducted with innovators in 12 EU countries;*
3. *Feedback from the innovators summarised in deliverable 6.1, with recommendations for the final version of CASI-F.*

Collective feedback on the usability and relevance of CASI-F for the assessment and management of SI, validation and possible refinements was extracted from country reports and relevant project deliverables and used in the final revision of CASI-F, which is the focus of this report. The findings and stakeholders' feedback were used and will be made available throughout this report as an endorsement, and in order to demonstrate how CASI-F developments have been informed through wider participation processes. CASI involved the four types of stakeholders noted above, dealing with the topics of climate actions, environment, resource efficiency, and raw materials, as well as participatory methods and sustainability.

When analysing and considering stakeholders' feedback to inform the final version of CASI-F, it was noted that comments were sometimes contradictory, in which case the majority of similar opinions on a particular issue was brought forward. Furthermore, several recommendations, while beyond the scope of the CASI project, were recognised as valuable and pointed towards useful directions for using and further expanding CASI-F. They will be considered to inform potential future developments of CASI-F.

The following section presents the final version of CASI-F by outlining its key principles and supporting testimonies from the stakeholders involved, in order to validate both the achievement of the main project's objective (development of a common framework for the assessment and management of sustainable innovation through public engagement of a broad spectrum of societal stakeholders) and the specific objectives of the state-of-the-art activities, as listed and offered in the project's description of work:

- *a working definition of sustainable innovation, building on common definitions, the academic literature and expert advice internal and external to the project consortium;*
- *ways to include the general public's concerns in assessing the social impact of these innovations on society through consultation workshops;*
- *a common understanding of best practices in sustainable innovation management;*
- *a framework for assessment and management of sustainable innovations;*
- *specific policy recommendations on how to improve innovation management and how sustainability considerations can be incorporated into it based on the findings of the assessment framework and public consultations.*



## 4. CASI-F principles



The significance, as well as vague nature of SI, with its potential to address the complex societal challenges the world is facing in the 21st century, calls for the development of more effective tools and approaches to facilitate better assessment and management of SI. For this reason, a carefully designed and structured process of systematically conducted activities supported the development of CASI-F, a holistic framework with the capacity to consider the multi-dimensional, multi-stakeholder and innovation system perspectives. Furthermore, CASI-F builds on hands-on experience and lessons learned through mobilisation and mutual learning activities, hence it evolved from within its creation following the assessment components designed to map SI initiatives, and from the management components that focused on the development and prioritisation of actions and roadmaps supporting the sustainability of innovations.

While CASI-F promotes a structured process supported by five sets of tools and protocols, it is at the same time flexible and versatile enough to stimulate reflection and confront users with the self-search and out-of-the-box thinking required to tackle complex societal challenges with a multi-systemic approach. Figure 2 illustrates how the five-step approach of CASI-F was applied to innovations (cases), policies (briefs) and aspirations (visions).

*"The CASI-F was especially praised for its 'holistic approach' that includes multiple functionalities and is well elaborated, detailed, in-depth going and holistic. Comments refer to the potential contributions of CASI-F to the planning and structuring of a SI, the integration of different stakeholder groups and the incorporation of policies, visions and SI cases into one framework".*

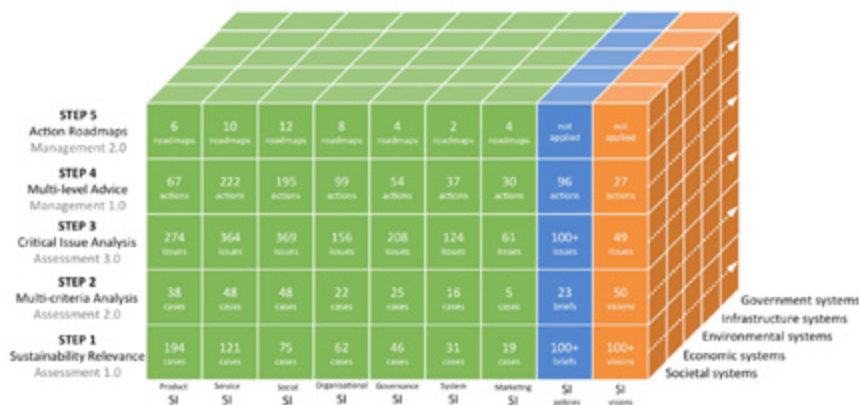
*"CASI-F is clearly considered to be very well elaborated, detailed, in-depth going and holistic (AT, BG, CZ, DE, FI, PL, PT, SI, UK). One of the positive characteristics of CASI-F's holistic approach is that it supports the planning, structuring, preparing and even evaluating SI (AT, BG, CZ, DE, IT, PT, SI, UK)".*

*Source: Schwarz-Woelzl et al., 2016*

*"The framework encouraged a structured thought process and the incorporation of the different stakeholders and management levels promoted dimensions, which might not always have been included in the planning previously."*

*Source: Martin and Avarello, 2016*

Figure 2: CASI-F Sustainability Cube



Three parallel and complementary analytical approaches are combined in CASI-F and were to some extent piloted during the project (as reflected in Figure 2 and the visualisations CASI-F tracks in Annexe 3). First, the tracking of sustainable innovations in terms of their practices, outcomes and players (Track 1). Second, the tracking of sustainable policies through the analysis of national and European level policy developments on climate action, environment, resource efficiency and raw materials (Track 2). Third, the tracking of sustainable aspirations of citizens and experts engaged in visioning and priority-setting exercises (Track 3). While a more detailed account of the three-track approach is available in the CASI 2nd Annual Policy Report (Popper and Velasco, 2017), for the purpose of this report we will focus in Chapter 5 on the fully piloted first track of CASI-F, i.e. the five steps (protocols and tools) applied to innovations (as highlighted in Tables 1–3 below); however, it is important to briefly mention the wide application of CASI-F and additional benefits of the combined approach, as described in this chapter.

(3) accountability demands more clarity and responsibility among those who formulate and implement EU policies; (4) effectiveness calls for more effective, timely, objectives-aligned, proportionate and impact-evaluated policy initiatives; and (5) coherence requires consistent policies and actions that are easily understood by the public, despite their use in complex and uncertain problems such as climate change and resource scarcity.

Table 1 shows how CASI-F tracks align with basic responsible governance principles.

Table 1: CASI-F alignment with responsible governance principles

Inevitably, the three tracks share some overlapping elements; however, the benefits of introducing the three tracks into the assessment and management of sustainable innovation lies in the creation of a complementary yet distinct enough set of protocols and tools for each of them. Regardless of the distinct features, the purpose of these protocols and tools in the context of innovations, policies and aspirations remains the same in terms of the assessment (i.e. scanning, mapping, and critical issues identification and analysis) and management aspects (i.e. multi-level advice and actions roadmap) pertinent to each track.

## 4.1. CASI-F principle of responsible governance

CASI-F has been developed to support government, business, civil society, and research and education actors in promoting responsible research and innovation (RRI) and increasing the sustainability of their activities. In so doing, CASI-F underpins basic principles of good governance (EC, 2001) where: (1) openness highlights the need for more efficient and transparent communication of EC activities to the public; (2) participation assumes that promoting wide participation in policy development helps to reinforce confidence in the European institutions;

| Responsible Governance Principles | CASI-F Track 1 Innovations                                            | CASI-F Track 2 Policies                                                       | CASI-F Track 3 Aspirations                                                       |
|-----------------------------------|-----------------------------------------------------------------------|-------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| Openness                          | Sharing SI initiatives through the CASIPEDIA database                 | Facilitating access to CASI policy briefs and policy blogs                    | Sharing citizen visions through CASI Visions Bank                                |
| Participation                     | Engaging with stakeholders, innovators and experts                    | Promoting policy debates through CASI policy blog                             | Eliciting desirable futures from civil society actors                            |
| Accountability                    | Dynamic assessment and tracking of SI practices, outcomes and players | Disseminating EU/national SI policy developments                              | Assessing expert-based research priorities' alignment with citizen visions       |
| Effectiveness                     | Generating SI actions from systematic SI initiatives analysis         | Comparing policy initiatives and supporting policy advice                     | Translating citizen visions into research priorities                             |
| Coherence                         | Co-producing advice at strategic, tactical and operational levels     | Aligning policy advice with emerging policy goals, e.g. avoiding redundancies | Identifying the economic, social and environmental benefits of citizens' visions |

## 4.2. CASI-F principle of practical advice orientation

In order to ensure that the tracking of innovations, policies and aspirations goes beyond academic purposes to meet the ambition of becoming a common framework for the assessment and management of sustainable innovation capable of offering practical and effective advice, CASI-F approaches, tools and protocols have also considered the five RACER criteria of the EC's Impact Assessment Guidelines (EC, 2009) by being Relevant, Accepted, Credible, Easy and Robust (see Table 2).

Starting from rapidly growing and diffusing innovations to recently formulated and implemented policies at national and EU levels to emerging and evolving aspirations, CASI-F focuses on the assessment of both codified and tacit knowledge concerning the EU Horizon 2020 SC5.

While the assessment and management of sustainable innovations supports the acceptance of CASI-F by a growing community of stakeholders (government, business, civil society, and research and education actors) involved in the mapping of sustainable innovations in the CASI knowledge platform (CASIPEDIA), the complementary focus on sustainable 'policies' and 'aspirations' also helps to stimulate mutual learning, public engagement and the mobilisation of citizens, sustainability experts and policy-makers.

The use of transparent and reliable sources of information for the assessment of ongoing innovations, but also current policies and shared visions, makes the information resulting from the use and application of CASI-F even more credible and reliable. CASI-F builds on primary sources (such as interviews, original research papers and book chapters as well as direct accounts and individual views of innovators, citizens and experts), secondary sources (including review articles and meta-analysis of the available literature) and tertiary sources (e.g. databases and compilations of primary and secondary sources in both professional editor-based and community-written encyclopaedias like Wikipedia).

| RACER<br>Impact<br>Assessment<br>Criteria                                                     | CASI-F Track 1<br>Innovations                                                                                                                | CASI-F<br>Track 2 Policies                              | CASI-F Track 3<br>Aspirations                   |
|-----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|-------------------------------------------------|
| <b>Relevant<br/>(closely linked<br/>to European<br/>sustainability<br/>objectives)</b>        | All CASI-F tracks are focused on the Horizon 2020 Societal Challenge on 'climate action, environment, resource efficiency and raw materials' |                                                         |                                                 |
| <b>Accepted<br/>(by key<br/>stakeholders,<br/>especially<br/>innovators)</b>                  | All types of stakeholders                                                                                                                    | Especially policy makers                                | Especially citizens and experts                 |
| <b>Credible<br/>(with<br/>transparent<br/>and trustable<br/>sources)</b>                      | Ongoing innovations                                                                                                                          | Current policies                                        | Shared visions                                  |
| <b>Easy<br/>(in terms of<br/>data collection<br/>and analysis<br/>at reasonable<br/>cost)</b> | Open mapping<br>Desk research<br>Interviews                                                                                                  | Desk research<br>Briefing<br>templates<br>Editing board | Citizen panels<br>Expert panel<br>Desk research |
| <b>Robust<br/>(replicable and<br/>systematic<br/>process)</b>                                 | CASIPEDIA<br>Ideas Bank<br>Actions Bank                                                                                                      | Policy Briefs<br>Policy Blogs                           | Visions Bank<br>Ideas Bank<br>Actions Bank      |

Table 2: CASI-F alignment with the RACER criteria of the EC Impact Assessment Guidelines

CASI-F has also adopted an easy yet well-thought out set of protocols and procedures for data collection and analysis. Data on sustainable innovations is collected using an open mapping environment, which allows CASI team members and innovators to codify and analyse information resulting from desk research and interviews with key stakeholders having knowledge of a given product, service, social, organisational, governance, system or marketing innovation. Data on sustainable policies is generated through a collective and distributed network of CASI partners and country correspondents via desk research on a selected theme or topic. The results of this research are fed into online policy briefing templates, which are reviewed by an editorial team overseeing the quality of the briefs. Finally, data concerning sustainable aspirations was gathered through the organisation of two rounds of citizen panels promoting public engagement and supported by an expert panel identifying research priorities inspired by citizen visions, and by an aspirations mismatch and convergence analysis carried out by the CASI team through desk research.

*“...the participants frequently highlighted their appreciation of the database CASIPEDIA with sustainable innovation practices. Not only the concrete manifestation as a database was acknowledged, but also the general function of CASI-F as a ‘knowledge hub’ that offers the possibility to foster a SI stakeholder network.”*

*“It is seen as ‘systematic, structured and understandable approach in generating and presenting good practices’ (BG) and could serve as inspiration for innovators (CZ, DK, PL, PT). CASIPEDIA ‘contains very rich and interesting information for policy analysis and scientific analysis on SI initiatives’ (BE). In this regard CASIPEDIA allows innovators to learn about SIs faced with similar challenges (DE, CZ, UK). It is a ‘fantastic tool for researchers’ (identifying example case studies for training activities, informing lectures, seminars) (UK) and helps to spread one’s SI (FI, PL).”*

*“Furthermore, CASIPEDIA has great potential for inspiring new ideas and enabling the transfer of practices from one field to another bridging the gap between sectorial approaches (AT, BG, DE).”*

*Source: Schwarz-Woelzl et al., 2016*

*“CASIPEDIA was a major point of deliberation in individual countries. Across national seminars, CASIPEDIA was widely considered to be a rich database of easy-to-compare cases of sustainable innovation, of cross-border character, offering various insights regarding the management and assessment of sustainable innovation practices, more generally. A largely appreciated aspect of CASIPEDIA is that it enables actors to map and share relevant information (practices, outcomes and players) about their innovation projects. Academic participants, in particular, praised the analytical potential of the database, finding it especially suitable for different research purposes (be they of qualitative or quantitative nature).”*

*“Participants noted that CASI has a lot to offer and that the potential synergies with other projects should be pursued. For instance, CASIPEDIA could serve as a rich source of data for students and researchers of innovation alike, which could in turn be further enriched with even more actionable information produced or collected by academics, practitioners and policymakers.”*

*“...provides visibility to more ‘modest’ (localised) innovation projects, which tend to be neglected by governments, policy-makers, industry or civil society.”*

*Source: Ivanov et al., 2016*

#### MML Box 3: On CASIPEDIA

Overall, the set of activities around CASI-F consists of replicable and systematic processes providing robust approaches and tools for the assessment and management of sustainable innovations, policies and aspirations. For innovations, the CASI-F tools comprise CASIPEDIA (for the mapping of SI initiatives), the Ideas Bank (for capturing and assessing critical issues) and the Actions Bank (for exploring possible ways in which critical issues might be managed at strategic, tactical and operational levels, and developing policy roadmaps for prioritised actions).

For policies, CASI-F relies on commonly agreed themes and topics used by CASI partners and country correspondents to write policy briefs and blogs where, in replicable ways, policy recommendations are provided at both national and EU levels. For aspirations, CASI-F offers the Visions Bank (connected to the above-mentioned Ideas Bank and Actions Bank) to allow for a systematic mapping of critical issues (barriers, drivers, opportunities and threats) associated with sustainable visions, while promoting a more public assessment and management of possible actions linked to such issues.

### 4.3. CASI-F principle of multiple sources of knowledge

CASI-F gathers knowledge and information from a wide range of sources in order to assist government, business, civil society, and research and education actors in the assessment and management of sustainable innovations. Sustainable innovations involve multifaceted processes embedded in numerous sectors and research areas. The diversity of actors involved in sustainability-oriented processes requires an inclusive and versatile analytical framework capable of generating new knowledge by combining evidence, expertise, creativity and interaction-based approaches (see Popper, 2008).

Finally, interaction with innovators mainly takes the form of open and voluntary interviewing and capacity-building processes. These processes help to promote active multi-stakeholder mobilisation and mutual learning, since selected innovations included product, service, social, organisational, governance, system and marketing innovations led by different types of stakeholders.

The tracking of sustainable policies (Track 2) builds on evidence from current European national and organisational policies relevant to a variety of themes and topics linked to the Horizon 2020 SC5. The identification of key themes and topics requires the collective expertise of the CASI team, which is responsible for coordinating the production of policy briefs and blogs during the life of the CASI project. Individual CASI

partners then take the lead in researching and writing policy briefs and blogs of national and European relevance, which demand some degree of creativity when it comes to producing policy recommendations and forward-looking advice for government, business, civil society, and research and education actors. Given the wide-ranging themes and topics addressed in the CASI policy briefs and topics, in this report the tracking of sustainable policies is focused on resource efficiency in the context of the Europe 2020 strategy.

The tracking of sustainable aspirations (Track 3) gathers evidence on the hopes, fears and related aspirations of around 200 citizens mobilised through a public

engagement process. This involved the organisation of citizen panels in 12 EU countries. The creativity element was integrated through the creation of 50 visions of EU citizens engaged in the creation of desirable futures, which can be based upon hopes and dreams - but also upon concerns and fears in relation to potential problems or challenges that are not desirable. The results of this creative vision-building exercise were used as inputs in an expertise mobilisation process where sustainability experts debated the citizens' visions clustered by themes and produced 27 research priorities. These priorities were then fed back into 12 'citizen-expert-citizen' processes in order to further promote public engagement and interaction in the assessment of joint sustainable aspirations at national level in 12 EU countries (Austria, Belgium, Bulgaria, Czech Republic, Denmark, Finland, Germany, Italy, Poland, Portugal, Slovenia and the United Kingdom) and at European levels.

| Sources of knowledge | CASI-F Track 1<br>Innovations | CASI-F Track 2<br>Policies | CASI-F Track 3<br>Aspirations  |
|----------------------|-------------------------------|----------------------------|--------------------------------|
| Evidence             | 500+ innovations from EU+     | National and EU policies   | Hopes and fears of citizens    |
| Expertise            | Innovators and CASI team      | CASI team                  | Sustainability experts         |
| Creativity           | Innovators and CASI team      | CASI partner               | 50 visions from EU citizens    |
| Interaction          | Interviewing and coaching     | CASI editorial task forces | Citizen-Expert-Citizen process |

*Table 3: CASI-F sources of knowledge and strategic intelligence*

The tracking of sustainable innovations (Track 1) supplies evidence from 500+ international sustainable innovation cases. The overall rationale of undertaking such a large-scale inductive approach was to focus on real innovations at their implementation or diffusion stages, as those involved in these stages would be the primary target users of CASI-F in the future. The expertise is based on innovators' and CASI team members' ability to analyse the socio-technical system in which the innovation operates, including landscape, regime and niche-levels factors.

Some elements of creativity are brought in to complement the expertise of innovators, especially when it comes to brainstorming about possible short-medium-to-long-term actions that government, business, civil society, and research and education actors could undertake to increase the sustainability of a given innovation.

"...it is understandable, logically developed and structurally sound. The holistic approach it takes can be supportive in planning, structuring and even evaluating SI cases and make the user aware of SI impacts on different stakeholder groups. Thus, it has the potential to foster collaboration and knowledge exchange among the relevant actors. As the framework is backed up with a vast amount of already gathered knowledge (CASI intelligence-visions, policy briefs, initiatives) it improves the user's understanding of SI. In this context the participants especially highlighted the data-richness accessible through CASIPEDIA."

"Educational programmes at universities could follow the logic of the framework (BG) which in turn could help systematising the innovative ideas (BG)."

"CASI-F does not only have the potential to be a knowledge sharing platform for SI cases (AT, CZ, DK, PL, PT, UK) but also 'helps to create a common space of ideas for all types of actors' (BG). It supports networking with similar projects and enables the exchange of information and knowledge (AT, CZ). The CASI-F has the potential to foster collaboration and exchange of experiences (CZ, DK, UK) as well as add value through enabling cooperation and generating synergies (AT, CZ)."

Source: Schwarz-Woelzl et al., 2016

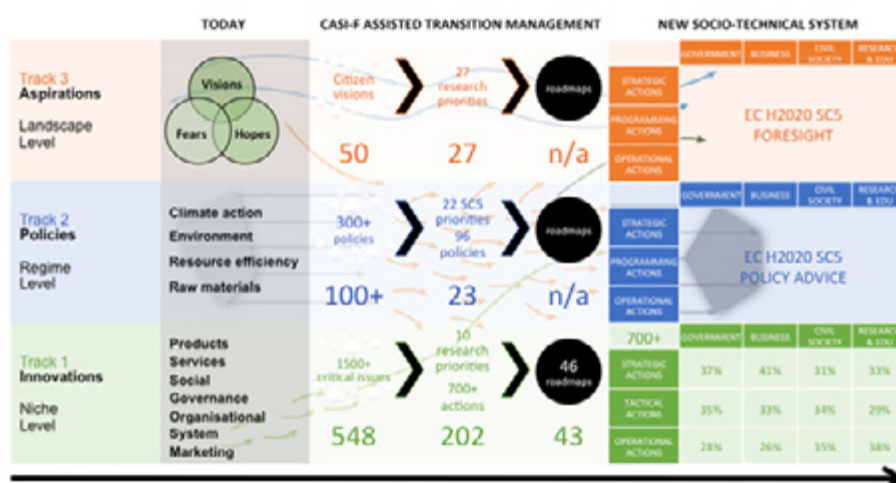
MML Box 4: On the strengths of CASI-F

## 4.4. CASI-F principle of multi-level perspectives and transitions

The volume and complexity of transitions and socio-technical system transformations at the niche level of innovations, the regime level of policies and the landscape level of aspirations to sustainability makes it difficult to devise a single optimal procedure to assess and manage sustainable innovations addressing SC5. The variety of systemic changes and their dynamic nature calls for a heuristic framework capable of accelerating the process of identifying satisfactory responses to critical issues related to this and other societal challenges. As a result, we have taken a multi-level perspective (MLP) approach to develop CASI-F as a set of protocols and tools supporting the assessment and management of critical issues influencing different types of innovations (level 1 or niche), current national and supranational policies (level 2 or regime) and the aspirations of multiple stakeholders, combining lay and expert perspectives on sustainability (level 3 or landscape).

The MLP approach is also a heuristic tool for understanding past, current and possible future changes in socio-technical systems, based on the analysis of multi-level transformations in economic, societal, environmental, infrastructure and government systems. Through such a systematic analysis of multi-systemic sustainability (see section 4.5), CASI-F helps to identify and assess critical issues (e.g. barriers, drivers, opportunities and threats) that require single- or multi-stakeholder actions at the strategic, tactical or operational decision-making levels. This is then complemented with a multi-criteria assessment and prioritisation of resulting actions, some of which are further developed into action roadmaps with the aim of supporting, on the one hand, the sustainability of existing innovations, policies and aspirations, and, on the other hand, the transition towards a better and more sustainable socio-technical system.

Figure 3: CASI-F assisted Socio-technical System Transitions



## 4.5. CASI-F principle of multi-systemic sustainability assessment and management



CASI-F recognises the importance of a multi-systemic sustainability assessment applied to 202 innovations. Overall, CASI-F used 44 criteria to assess 'positive' transformations in societal, economic, environmental, government and infrastructure systems.

- **(SOC) Societal systems criteria:** Population development and composition; Income distribution and class structure; Social security and ageing provisions; Social interaction and communication; Social behaviour; Civil liberties and human rights; Gender, social class and groups equity; Individual autonomy and self-determination; Education and qualification; Human health; Individual behaviour.
  - **(ECO) Economic systems criteria:** Production; Consumption; Local trade; International trade; Labour and employment; Financial system; other macroeconomics transformations.
  - **(ENV) Environmental systems criteria:** Environmental protection laws and policies; Resource extraction policy and practice; Protection of renewable resources; Protection of species and ecological heritage; Protection of cultural heritage; Rights of future generations.
  - **(GOV) Government systems criteria:** Government administration; Public finances and taxes; New Governance institutions; Political participation and democracy; Conflict control and resolution; Population and immigration policy; Government intelligence; International assistance and aid policy; Industry and Technology policy.
  - **(INF) Infrastructure systems criteria:** Settlements and cities; Transportation and distribution; Waste management; Health services; Communication and media; Energy, water and food supply system; other goods supply system; Services supply system; Creation, destruction or modification of research, technology development and innovation (RTDI) institutions/organisations; Knowledge-transfer channels; RTDI wiring up and collaborative connections.
- Figure 4 shows the results of this assessment, normalised to the maximum positive transformation score, since the main purpose of this analysis was to identify those important areas where sustainable innovations had made significant multi-systemic positive transformations. In total, 18 criteria showed very high, high and moderate impact (representing 64% of the total positive transformations of the 202 SI cases):
- **Four economic systems criteria** (representing 24% of the top 18 criteria transformations): Consumption (e.g. re-orientation of consumption towards resource-efficient products and services that reduce toxic materials and emissions); Production (e.g. implementation of effective circular economy practices and processes that reduce raw material and energy use, as well as negative environmental impacts); Local trade (e.g. supporting economically disadvantaged producers through fair trade policies); and Labour and employment (e.g. improvement of occupational health and safety, labour rights and conditions).
  - **Four societal systems criteria** (23%): Social behaviour (e.g. car sharing); Individual behaviour (e.g. repairing rather than replacing); Social interaction and communication (e.g. crowd-driven clean-up initiatives); Education and qualification (e.g. understanding the carbon footprint of lifestyles).
  - **Five infrastructure systems criteria** (20%): Energy, water and food supply system (e.g. vertical agriculture initiatives); Waste management (e.g. high-tech circular use and reduction of waste); Settlements and cities (e.g. greening the city); Transportation and distribution (e.g. cycle to work scheme); Knowledge-transfer channels (e.g. online sustainability tutorials).
  - **Four environmental systems criteria** (19%): Rights of future generations (e.g. investments in sustainable energy sources); Protection of renewable resources (e.g. conscious use of hydro and biomass energy plants); Environmental protection laws and policies (e.g. car-free city centres); Protection of species and ecological heritage (e.g. preserving biodiversity and natural environments).
  - **One government systems criterion** (14%): Political participation and democracy (e.g. crowd-funded sustainability initiatives).

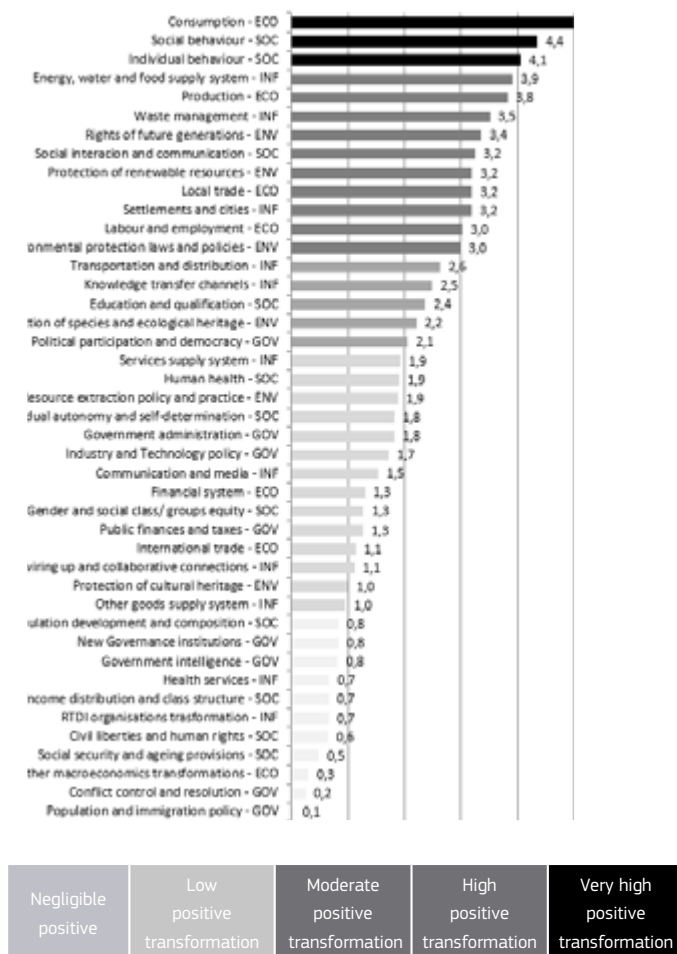


Figure 4: CASI-F assessment of multi-systemic sustainability

The assessment of ‘negative’ multi-systemic transformations, such as the cross-sectoral ecological impact of the construction, energy, emission, food and water footprints, is also extremely important. However, CASI-F was conceptualised and developed as a complementary framework rather than an alternative framework to the wide-ranging and widely used set of methods and tools supporting sustainability assessment. The main reason for CASI-F to take this approach is self-evident in the findings of the EC-funded SAMT project on ‘Sustainability Assessment Methods and Tools to support decision-making in the process industries’. SAMT conducted a systematic overview of existing sustainability assessment approaches and best practices across many sectors and industries, which helped to identify more than 100 methods and tools. From these, 51 methods and 38 tools were studied and clustered into the following six groups (Saurat et al., 2015; Lopez et al., 2015; Pihkola et al., 2016 a):

- **Life cycle methods:** Life Cycle Assessment (LCA), subsets or derivatives of LCA, and life cycle methods beyond environmental assessment.
- **Hybrid methods:** Fusion of existing methods (the limit between methods becomes blurred) in order to increase the scope of each individual method.

- **Integrated methods:** Juxtaposition of well-delimited methods (‘Russian dolls’ construct) to support decision-making. Usually includes a weighting scheme to aggregate sub-indicators into one or a small number of indicators. **Full LCA tools:** Implementation of ISO-conforming LCA and possibly other life cycle methods.
- **Simplified LCA tools:** Implementation of streamlined LCA and possibly other life cycle methods.
- **Integrated tools:** Interestingly, available integrated tools do not implement the integrated methods described above but provide their own combinations of methods.

Moreover, a SAMT report on ‘Future research needs and input for standardisation’ (Pihkola et al, 2016b) reviews and discusses the challenges of some 80 International Organization for Standardization (ISO) existing standards and projects in development-related sustainability assessment. Among the main conclusions from this report are:

- *Simplified LCA-based methods and tools for regular use within companies;*
- *Comprehensive assessments integrating different aspects of sustainability to support decision-making;*
- *Hybrid methods and tools for cross-sectoral and sectoral assessments;*
- *Methods and tools for addressing regional or local impacts;*
- *Assessing and communicating positive aspects within the LCA framework;*
- *Support for method and tool selection in different decision-making contexts.*

In line with these findings on existing methods, tools and standards, CASI-F was conceived as a set of protocols (interconnected methods) and tools (interconnected web-based applications) to support the assessment and management of sustainable innovations. In other words, CASI-F is not meant to compete with or replace the above-mentioned sustainability assessments but rather to support multi-level and multi-stakeholder decision-making related to sustainability-oriented innovations, policies and aspirations. Therefore, in practical terms, CASI-F consists of five interconnected sets of protocols and tools:

- for **sustainability relevance and scanning;**
- for **multi-criteria analysis and assessment;**
- for **critical issue analysis and assessment;**
- for **multi-level advice management;**
- for **action roadmaps management.**

# 5. CASI-F methodology

## 5.1. Step 1: CASI-F protocols and tools for sustainability relevance and scanning

Since 2014, 19 CASI project partners and 16 country correspondents covering all EU28 countries have been engaged in a rigorous and systematic environmental scanning process to identify sustainable innovations achieving or aiming for positive environmental, social and economic transformations in Europe and the world. More than 500 solutions were scanned and nominated between June and December 2014. The solutions included the following seven types of innovations (see Glossary):

- 
- **Product** innovation, i.e. new/improved goods or technology;
  - **Service** innovation, i.e. new/improved activity or process;
  - **Social** innovation, i.e. new/improved solution to a social problem;
  - **Organisational** innovation, i.e. new/improved practice, configuration or business model;
  - **Governance** innovation, i.e. new/improved regulation, policy or form of stakeholder engagement;
  - **System** innovation, i.e. new/improved set of interconnected innovations/socio-technical changes;
  - **Marketing** innovation, i.e. new/improved promotion or positioning of any kind of innovation.

In addition, all nominations had to be relevant to one or more of the 22 priority areas of the Horizon 2020 SC5 (see Table 4).

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Climate action</b>      | <ul style="list-style-type: none"> <li>• Climate change projections and scenarios</li> <li>• Climate change adaptation solutions</li> <li>• Climate change mitigation solutions</li> <li>• ICT to assess and predict climate actions</li> <li>• Climate action by sustainable lifestyle</li> <li>• Climate action eco-innovation policies</li> </ul>                                                                                                               |
| <b>Environment</b>         | <ul style="list-style-type: none"> <li>• Biodiversity examination and understanding</li> <li>• ICT mapping of natural resources and trends</li> <li>• Solutions for cultural heritage assets</li> <li>• Strategic intelligence and citizens' participation</li> </ul>                                                                                                                                                                                              |
| <b>Resource efficiency</b> | <ul style="list-style-type: none"> <li>• Solutions to water imbalances</li> <li>• ICT systems improving resource efficiency</li> <li>• Resource efficient sustainable lifestyles</li> <li>• Eco-innovation and green economy transition</li> </ul>                                                                                                                                                                                                                 |
| <b>Raw materials</b>       | <ul style="list-style-type: none"> <li>• Long-term raw materials availability</li> <li>• Solutions for exploring, extracting, processing and recycling</li> <li>• Alternative raw materials</li> <li>• Awareness of raw materials shortage</li> <li>• ICT systems to map raw materials trends</li> <li>• Eco-solutions to reduce raw materials use</li> <li>• Raw materials-conscious sustainable lifestyle</li> <li>• Effective raw materials policies</li> </ul> |

*Table 4: CASI-F use of EC priorities in climate action, environment, resource efficiency and raw materials*

*"Another strength is the overall contribution to a better understanding of SI, which will contribute to the 'better formulation and implementation of policies and measures' in the field of SI both on national and regional level, as well as of better implementation of EU projects in this field (BG, CZ, FI, IT). Beyond that CASI-F is seen as an initiative that contributes to the 'debate, organization and dissemination' of concepts of SI (PT). In this sense CASI-F is also seen as a framework contributing to the EU Horizon 2020 sustainability goals (CZ)."*

*"The 'pragmatic' (CZ) and 'standardised' (IT) approach is useful both in the conceptualisation and management of a SI (FI). CASI-F contributes to the development of a 'macro-framework for management of sustainable innovations' (BG). Additionally, CASI-F simplifies the collection of necessary data to assess SI's own relevance towards sustainable innovation and supports identifying strategic actions (IT) as well as strategic thinking and planning (CZ, PT). While it enables strategic thinking, CASI-F also fosters brainstorming and the generation of new ideas (BG, DE, IT). With its comprehensive approach 'CASI-F is complex enough to point out strong and weak points of any SI' (CZ, PL) and therefore contributes to benchmarking SIs (CZ, IT). CASI-F allows assessing the SI impact at economic, social and sustainable level for different stakeholders (PT). The approach to base the CASI-F 'on actual sustainable innovation cases' (FI) is seen as a good starting point and bears the potential to get to 'complex evaluations of possible results' of SI (CZ)."*

*"The 'integration of policies, visions and sustainable innovation initiatives' (CZ) into CASI-F is appreciated as an added value (CZ, UK), because it helps to increase the understanding of key dimensions, aspects and critical factors of SI (CZ) and the 'roles of the seven types of innovations towards the EU sustainability goals' (CZ). Visions are seen to be an important leverage to engage citizens, to raise awareness for sustainable innovations, to gain knowledge about tendencies or trends (CZ, PL) and to get 'out-of-the-box thinking' into the innovation process (UK). By providing space to share visions among different stakeholder groups CASI-F could also help to promote the buy-in or take-up of actions (UK) and add supportive services for a product (FI, CZ). Additionally, the whole concept identifies a 'gap in potential new markets' or business (UK) and can potentially be very useful for start-ups."*

Source: Schwarz-Woelzl et al., 2016

*MML Box 5: On sustainability relevance and scanning*

*"It was encouraging to see the innovator want to be part of the pilot project and he finds it is important to develop this kind of tool. So it shows us that there is a demand for a tool for assessment and management of sustainable innovation".*

Source: Martin and Avarello, 2016

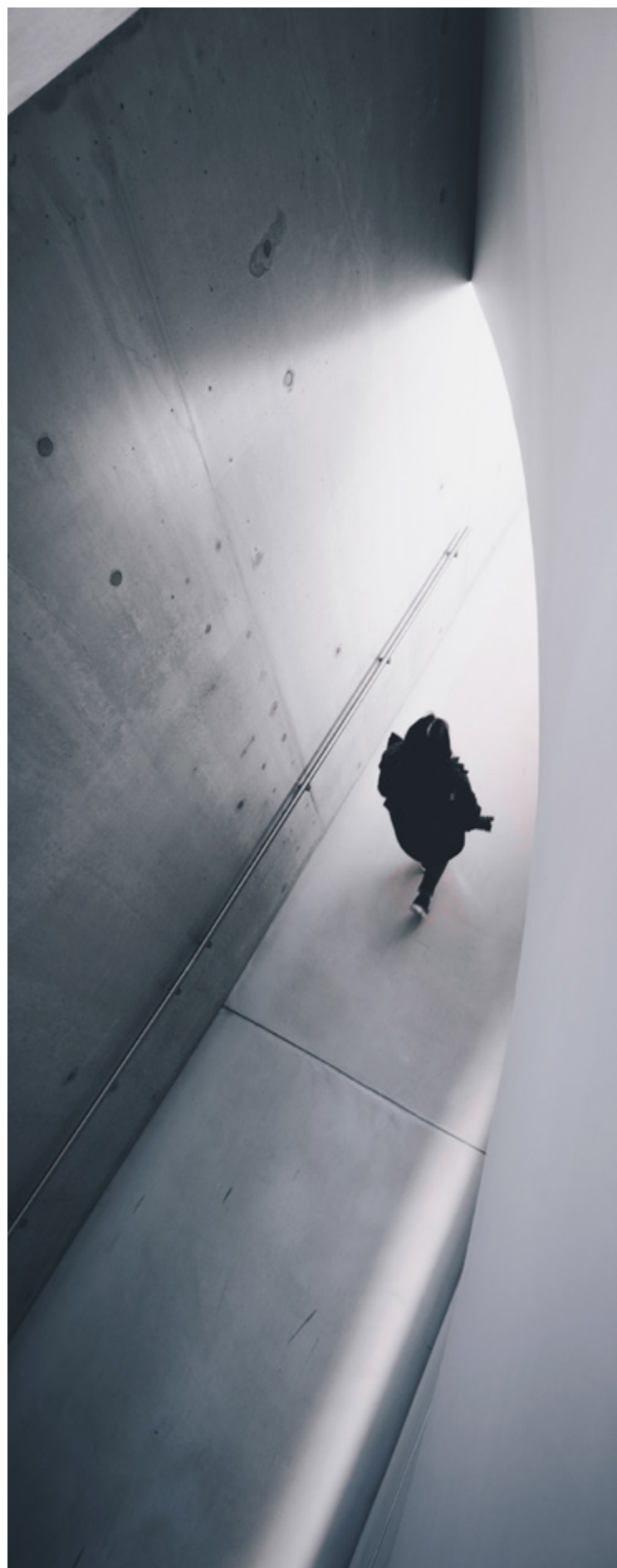
*MML Box 5: On sustainability relevance and scanning*

Furthermore, to promote a more systematic mobilisation and mutual learning approach to sustainable innovation, CASI partners and country correspondents were encouraged to identify solutions with wider sectoral relevance. Some 15 to 22 nominations were requested from each of the EU28 country teams who were asked to cover as many of the 21 economic activities as possible from the International Standard Industrial Classification (ISIC) of All Economic Activities (see Table 5 below).

A panel of sustainability experts from within the CASI consortium reviewed and assessed all nominations in terms of their relevance to SC5.

To further focus the selection of solutions to the needs of national and European policies in the area of public engagement and sustainability, a second assessment conducted independently by three CASI team members required a 1 to 5 scale rating of nominated innovations against the following five criteria: (1) Degree of public participation and mobilisation; (2) Degree of sustainability and cross-sectoral linkages; (3) Degree of multi-dimensional transformations; (4) Degree of deployment and diffusion; (5) Degree of novelty and originality. The results of this multi-criteria assessment were used to create a scoring system for the nominated solutions. To achieve EU-wide coverage, the six highest scoring innovations from each EU28 country were chosen (168 solutions) together with 34 other high-scoring innovations, including some international cases. Overall, a total of 202 innovations were selected and upgraded to a 'deep dive' assessment process, also known as fully-fledged mapping of sustainable innovation practices, outcomes and players.

- Agriculture, forestry and fishing
- Mining and quarrying
- Manufacturing
- Electricity, gas, steam and air conditioning supply
- Water supply; sewerage, waste management and remediation activities
- Construction
- Wholesale and retail trade; repair of motor vehicles and motorcycles
- Transportation and storage
- Accommodation and food service activities
- Information and communication
- Financial and insurance activities
- Real estate activities
- Professional, scientific and technical activities
- Administrative and support service activities
- Public administration and defence; compulsory social security
- Education
- Human health and social work activities
- Arts, entertainment and recreation
- Other service activities
- Activities of households as employers
- Activities of extraterritorial organisations and bodies



*Table 5: CASI-F use of International Standard Industrial Classification of Economic Activities*

**CASI**  
Public Participation in Developing a Common Framework for Assessment and Management of Sustainable Innovation

**SI Name**  
Enter the answer

**SI Description**  
If available, please upload image/photo associated to this SI **UPLOAD A FILE**  
Use the NACE classification below to select up to 3 socio-economic sectors where the sustainable innovation is currently and/or likely to be applied.  
Select up to 3 socio-economic sectors  
If you selected **MANUFACTURING** in the previous question, please select up to 3 areas where the sustainable innovation is currently and/or likely to be applied.  
Select up to 3 areas

**SI URL**  
Enter the url address

**SI Lead organisation**  
Enter the answer

**Type**  
☐ Civil society  
☐ European Union  
☐ Non-State actor  
☐ Government actor (Departments, Agencies, etc.)  
☐ Business actor  
☐ Research and education actor

**PRINT** **SAVE**

*Tool Box 1: CASI-F tool for sustainability relevance and scanning*

This Tool Box shows a screenshot of the first CASI-F tool supporting the sustainability relevance and scanning of SI initiatives. The tool is available for all registered CASI community members and can be accessed through the main navigation menu of the CASI portal, by clicking on the 'map a case' button on the main page of CASIPEDIA or by going to the following URL: <http://www.casi2020.eu/casipedia/map-a-case/>

In total 15 criteria are used during the first step of the CASI-F methodology: (1) SI Name; (2) SI Description; (3) SI URL; (4) Lead organisation; (5) Lead organisation URL; (6) SI Scope; (7) Link to H2020 priorities; (8) SI Type; (9) SI Objectives; (10) SI Factors of success; (11) SI Barriers; (12) SI Drivers; (13) SI Opportunities; (14) SI Threats; and (15) Systemic sustainability (see Section 4.5). The assessment of initiatives against these criteria can be conducted individually by the innovator (self-assessment), a trained mapper (CASI team member or country correspondent) or collectively by a group of experts or CASI community members invited to assess a given SI initiative.

## 5.2. Step 2: CASI-F protocols and tools for multi-criteria analysis and assessment

The mapping of the selected SI focused on 3 'deep dive' assessments using a total of 34 criteria (Table 6):

**SI Practices assessment:** This includes 21 criteria providing a panorama of the actual innovation, including both descriptive information and a detailed assessment of key objectives, origins, factors of success, barriers, drivers, tensions, funding and market potential, mobilisation degree, mutual learning processes, geographical and sectoral transferability and use of assessment methods.

**SI Outcomes assessment:** This includes nine criteria exploring both current and possible future outcomes of the innovation. The first two criteria focus on the degree and status of the innovation

outcomes, followed by a structured assessment of strengths and weaknesses using nine sub-criteria (Novelty; Complexity; Protection of intellectual property rights (IPR); Timing; Robust and platform design; Rewriting the rules; Reconfiguration of production, distribution and consumption; Sectoral applicability; and Geographical replicability). This is followed by a forward-looking assessment of seven types of opportunities and threats (technological, economic, environmental, political, social, ethical and spatial). Additional outcomes such as new policies, spin-offs, publications, skills and competences are also mapped. Finally, the systemic sustainability criterion includes 44 sub-criteria assessing positive contributions to five sub-systems of the broader socio-technical system (see Section 4.5 and Figure 4 above).

**SI Players assessment:** This included the mapping of role, type and contact details of innovators, funders and sponsors, supporters and brokers, as well as beneficiaries and users.

| SI Practices assessment criteria                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | SI Outcomes assessment criteria                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | SI Players assessment criteria                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ol style="list-style-type: none"> <li>1. SI Name</li> <li>2. SI Description</li> <li>3. SI URL</li> <li>4. SI Leader</li> <li>5. SI Leader URL</li> <li>6. SI Scope</li> <li>7. SI Timeline</li> <li>8. SI Priorities</li> <li>9. SI Type</li> <li>10. SI Objectives</li> <li>11. SI Origins</li> <li>12. SI Factors of success</li> <li>13. SI Barriers</li> <li>14. SI Drivers</li> <li>15. SI Tensions</li> <li>16. SI Funding/market potential</li> <li>17. SI Mobilisation degree</li> <li>18. SI Mutual learning processes</li> <li>19. SI Transferability</li> <li>20. SI Lookalikes elsewhere</li> <li>21. SI Assessment methods</li> </ol> | <ol style="list-style-type: none"> <li>1. Degree and approach</li> <li>2. Stage of innovation</li> <li>3. Strengths and Weaknesses</li> <li>4. Opportunities and Threats</li> <li>5. Policies</li> <li>6. Spin-offs</li> <li>7. Publications</li> <li>8. Skills and competences</li> <li>9. Systemic sustainability <ul style="list-style-type: none"> <li>• Societal Systems <ul style="list-style-type: none"> <li>- 11 indicators</li> </ul> </li> <li>• Economic Systems <ul style="list-style-type: none"> <li>- 7 indicators</li> </ul> </li> <li>• Environmental Systems <ul style="list-style-type: none"> <li>- 6 indicators</li> </ul> </li> <li>• Infrastructure Systems <ul style="list-style-type: none"> <li>- 11 indicators</li> </ul> </li> <li>• Government Systems <ul style="list-style-type: none"> <li>- 9 indicators</li> </ul> </li> </ul> </li> </ol> | <ol style="list-style-type: none"> <li>1. Innovators <ul style="list-style-type: none"> <li>• Role</li> <li>• Type</li> <li>• Contact details</li> </ul> </li> <li>2. Funders/Sponsors <ul style="list-style-type: none"> <li>• Role</li> <li>• Type</li> <li>• Contact details</li> </ul> </li> <li>3. Supporters/Brokers <ul style="list-style-type: none"> <li>• Role</li> <li>• Type</li> <li>• Contact details</li> </ul> </li> <li>4. Beneficiaries/Users <ul style="list-style-type: none"> <li>• Role</li> <li>• Type</li> <li>• Contact details</li> </ul> </li> </ol> |

*Table 6: CASI-F criteria for the fully-fledged assessment of sustainable innovations*



This Tool Box shows a screenshot of the second CASI-F tool supporting the multi-criteria analysis and assessment of SI initiatives. The tool is available for all registered CASI community members and can be accessed through the main navigation menu of the CASI portal, by clicking on the 'map a case' button on the main page of CASIPEDIA or by going to the following URL: <http://www.casi2020.eu/casipedia/map-a-case/>

Over 30 criteria are used during the second step of the CASI-F methodology, which requires the mapping of (1) SI Practices; (2) SI Outcomes; and (3) SI Players. The mapping of initiatives against these can be conducted individually by the innovator (self-assessment), a trained mapper (CASI team member or country correspondent) or collectively by a group of experts or CASI community members invited to assess a given SI initiative.

Tool Box 2: CASI-F tool for multi-criteria analysis and assessment

### 5.3. Step 3: CASI-F protocols and tools for critical issue analysis and assessment

The nomination of 548 cases against the first 12 SI Practices assessment criteria (see Table 6 above) and the mapping of 202 cases against all aforementioned 34 SI Practices, Outcomes and Players criteria generated a rich and unique database on the state of the art of sustainable innovation in Europe and the world, also known as CASIPEDIA and available online at <http://www.casi2020.eu/casipedia/>.

The wealth of information about sustainable innovation in CASIPEDIA is far from fully analysed but, for the purpose of developing and piloting CASI-F, a 'targeted' assessment of CASIPEDIA data was chosen. Thus particular emphasis was given to the analysis of selected 'critical issues', i.e. key barriers, drivers, opportunities and threats that require further assessment and attention for management decisions. Some 1566 'critical issues' were mapped against nominated and selected cases with the active participation and engagement of relevant stakeholders (especially the innovators, but also the funders and sponsors, supporters and brokers, and beneficiaries and users, who were given access and invited to contribute to the assessment of sustainable innovations in CASIPEDIA). Given the strategic importance and often confidential nature of the 'critical issues' related to a specific innovation, the mapping team, as well as the innovators, were also allowed to restrict access to sensitive issues. The final set of publicly available issues can be explored online in the CASI Ideas Bank at <http://www.casi2020.eu/ideas-bank/>.

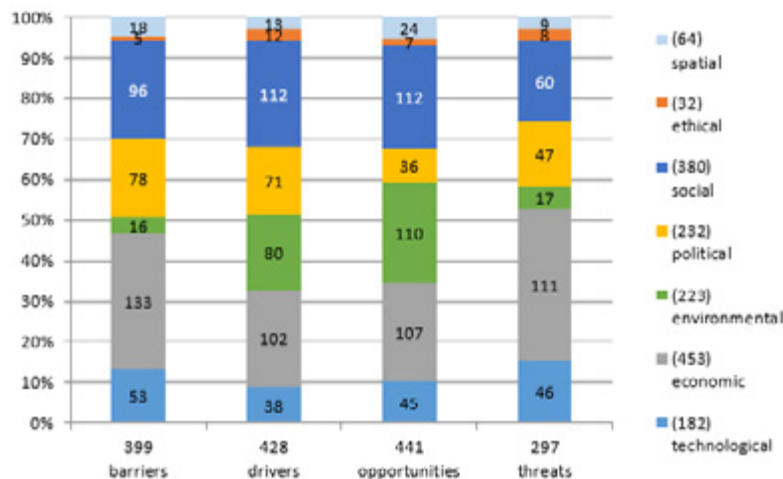


Figure 5: CASI-F assessment of critical issues from the CASI Ideas Bank

These issues were analysed following three complementary logics aiming to answer the following research questions:

- What lessons can be learned from the analysis of critical issues using seven analytical dimensions or perspectives, namely technological, economic, environmental, political, social, ethical and spatial?
- What type of actions are needed to deal with the positive and negative effects that such an extensive set of critical issues have on sustainable innovations?
- What type of action management framework can be created based on a meta-analysis of the critical issues from an innovation system perspective?
- Lessons from the analysis of critical issues using a multi-dimensional perspective

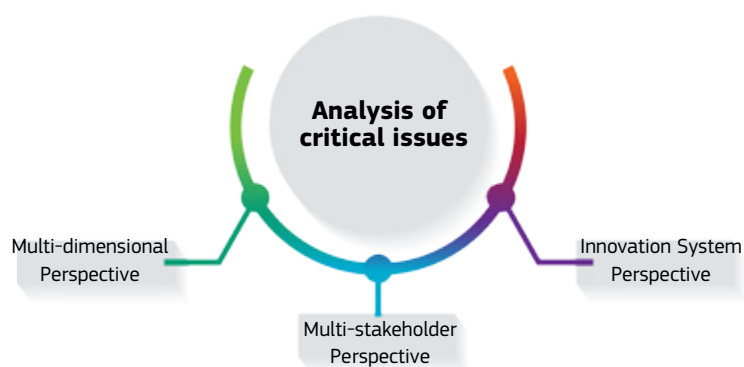


Figure 6: CASI-F multi-perspective logics in the analysis of critical issues

From a **technological perspective**, the analysis of 182 issues led to 11 lessons, namely to: analyse possible dependency on specific technologies; develop IPR strategies; elaborate technology development plans; identify and assume protection and imitation costs; make a plan for digital and social media communication; guarantee an easy use of innovation; create maintenance and contingency plans; reinforce technical capabilities and capacities for technological anticipation; ensure an adequate level of novelty in both radical and incremental innovations; develop supporting infrastructures; and comply with technological standards while reaching the right level of complexity.

From an **economic perspective**, the analysis of 453 issues led to 12 lessons, namely to: elaborate market expansion plans; create realistic business strategies; design capacity enlargement and production adjustment plans; differentiate between mass-production and differentiation strategies; define economic benefits targets, when applicable; define cost reduction objectives, when applicable; elaborate a strategy for local development; assess the possibilities and implications of self-employment; make a clear estimation of initial investments; evaluate the availability of future resources; ensure the stability of funds during the SI process; and increase or maintain adequate efforts in R&I.

From an **environmental perspective**, the analysis of 223 issues led to six lessons, namely to: understand the potential and implications of climate change adaptation and mitigation strategies; identify those environmental elements where the SI could have a better impact; develop environmental ex-ante impact measuring tools; evaluate the potential of the SI to solve energy problems; define and communicate how the SI is contributing to promoting sustainable life styles; and evaluate potential ecological collateral effects.

From a **political perspective**, the analysis of 232 issues led to eight lessons, namely to: understand bureaucratic processes; recognise and adapt to a government's political goals; analyse policy agenda opportunities; learn applicable regulation; monitor current and potential regulation changes; achieve sustainable political support; get timely access to experts and policy advisors; and assess lobbies' and competitors' reactions.

From an **ethical perspective**, the analysis of 32 issues led to five lessons, namely to: make ex ante evaluation of the SI ethical consequences; avoid the SI bringing about the exclusion of specific user-groups; develop a communication plan based on unambiguous organisational sustainability objectives; identify and integrate all affected community members; and communicate how the innovation is aligned with social values.

From a **spatial perspective**, the analysis of 64 issues led to four lessons, namely to: establish realistic demographic objectives, if applicable; align innovation with rural and local traditions; consider heritage preservation in the innovation conception; and distinguish between the results of SI local experimentation and their application to other environments.

All in all, 60 lessons or 'critical considerations' emerged from the meta-analysis of 1566 critical issues linked to 202 SIs, where both the variety and volume of lessons required additional analytical perspectives.

*"What worked well was that through the inclusion of various stakeholders into the matrix you were forced to think about different perspectives and how these may affect an innovation".*

*"The multi-stakeholder perspective is very, very relevant; even not every perspective is of the same importance (e.g. in this case, civil society is of lower relevance). But it is important to think about the case/initiative from all the four stakeholder areas. In this case the multi perspective was integrated right from the beginning of the project, but without the civil society perspective. The matrix helped to integrate this perspective as well."*

Source: Martin and Avarello, 2016

*"Users can easily take into account 'different interests and objectives' (DE) of various stakeholders which in turn allows to consider the SI as a whole (PT). Through the multi-stakeholder perspective it gets possible to take the 'implications and interdependencies' (CZ) of an SI into consideration."*

Source: Schwarz-Woelzl et al., 2016

*"Lecturers can rely on a well-structured procedure for analysing SI initiatives, which does not need to be strongly modified to be used in the context of a Master's course. Plenty of comprehensive supporting material is already available for students to better understand the overall CASI-F procedure (students can then work autonomously on most of the steps). The upcoming CASI online training course will further reinforce this aspect.*

*By contacting and interacting with innovators (potential employers), the students not only widen their network within the labour market but also promote the 'Management and Social Entrepreneurship' course, which may be of interest to start-ups, SMEs, and the like.*

*In general, I have a positive feeling about the potential use of CASI-F in university courses. Particularly when it comes to the area of sustainability and innovation (still under-researched and ambiguous in nature), it is very useful to allow students to deepen the topic by working in the field (by directly interacting with innovators)."*

Source: MML Interview with Mattia Martini – Researcher at the University of Milano-Bicocca (Annexe 5)

MML Box 6: On multi-stakeholder perspectives



*Tool Box 3: CASI-F tool for critical issue analysis and assessment*

The screenshot displays the CASI-F tool interface. At the top, a grid titled 'TEEPSSES critical issues' shows four categories: Drivers (green), Barriers (black), Opportunities (blue), and Threats (red). Each category is mapped to eight TEEPSES categories: Tec, Eco, Env, Pol, Soc, Eth, and Spa. Below this is the 'IDEAS BANK' section with a search bar and a 'Sort by' dropdown. A legend on the right shows a color-coded matrix for barrier, driver, idea, opportunity, and threat. Below the legend are filter options for 'TYPE OF INNOVATION', 'TYPE OF IDEA', 'TEEPSSES', and 'SI PRIORITY AREAS'.

CASI has mapped 500+ cases of Sustainable Innovations from across EU and beyond. From those, the 193 most CASI-relevant cases were selected for further analysis, which helped to gather a wide range of ideas that contributed to the development of the CASI Ideas Bank. These ideas are colour-coded and represent existing or potential: (1) barriers, (2) drivers, (3) opportunities, or (4) threats, which can influence the success (i.e. uptake/implementation/diffusion) of sustainable innovation.

To explore the Ideas Bank:

- ✓ Browse the ideas using the various filters
- ✓ Find out the type of idea and associated success factor clustered around TEEPSES categories (technological, economic, environmental, political, social, ethical, spatial) by hovering over Ideas' icons
- ✓ Add your own ideas

Search:  Sort by:

Filter

TYPE OF INNOVATION TYPE OF IDEA TEEPSES

SI PRIORITY AREAS

This Tool Box shows a screenshot of the third CASI-F tool supporting the critical issue analysis and assessment for SI initiatives. The tool is available for all registered CASI community members and can be accessed through the main navigation menu of the CASI portal, by clicking on the 'add an idea' button on the main page of the CASI Ideas Bank or by going to the following URL: <http://www.casi2020.eu/edit-idea/>

## 5.4. Step 4: CASI-F protocols and tools for multi-level advice management

In addition to the multi-dimensional perspective, the same 1566 critical issues were analysed, based on their influence on the selected innovations, using a multi-stakeholder perspective. This helped us to arrive at an important managerial conclusion: Critical issues require a multi-level and multi-actor advice approach.

The main lesson from the analysis of the positive and negative effects that the critical issues identified had on the mapped innovations was that the actions to manage such an extensive set of barriers, drivers, opportunities and threats might need to be implemented by multiple actors with different managerial roles and responsibilities.

Some 28 types of critical issue can be analysed and assessed during the third step of CASI-F methodology, which requires the identification of (1) drivers; (2) barriers; (3) opportunities; and (4) threats. The mapping of these critical issues can be conducted individually by the innovator (self-assessment), a trained mapper (CASI team member or country correspondent) or collectively by a group of experts or CASI community members invited to contribute to a given SI initiative. The following seven categories of critical issues are considered in CASI-F: technological, economic, environmental, political, social, ethical and spatial.



| Multi-level and Multi-actor (ML-MA) Actions Approach | Government actors                                                                                                                                                                                                                                                                                     | Business actors | Civil society actors | Research & education actors |
|------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|----------------------|-----------------------------|
| 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.           |                 |                      |                             |

*Table 7: CASI-F approach to multi-level and multi-stakeholder advice*

For example, the Food Bank Network operated by Fondazione Banco Alimentare Onlus, a civil society organisation in Italy, identified the existing regulatory and normative framework as a critical issue for the effective implementation and wide diffusion of its business model innovation, focused on the daily recovery of surplus food from the food supply chain and its redistribution to charitable organisations helping around two million deprived people in the country. However, the management of such a critical issue or barrier requires governmental actors, at the strategic level, to: formulate or implement new national policies on surplus food donations aimed at economically encouraging the private sector; and, at the operational level, to: organise and manage dialogue tables with operators, including policy-makers, businesses and not-for-profit civil society organisations – aimed at redesigning the regulatory system so as to acknowledge the needs of several stakeholders.

Similarly, the 202 SI cases studied in CASI helped us identify a wide range of critical issues, including not only barriers but also drivers, opportunities and threats, providing good examples of the kind of managerial situations where sound responses and solutions require multi-level (strategic, tactical and operational) and multi-stakeholder interventions.

*“...strong focus on action planning is a remarkable strength of the CASI-F matrix (BE, CC, CZ, DE, UK, IT, PT). This does not only help to improve the process of planning and implementing the SI practice, it also represents a simplification of the project context and hereby contributes to an exhaustive mapping of potential actions of the various stakeholders and the elaboration of a detailed action plan (PT, UK). The three levels of actions (strategic, tactical/programming, front-line/operational) were regarded by some as a time line, which could assist in an improved planning of the specific actions at specific stages of project development. This allows them to anticipate the possible impacts of the actions on different stakeholders (CZ, FI, SI, PT). This makes the matrix additionally valuable (DE, PT). Furthermore, the actions allow basic orientation and define measures needed that are aligned with the objectives and goals of an organisation (PT). Another positive side-effect of the action orientation is the assessment process, which offers a reflection process on the relevance and feasibility of initiatives and how sustainable they are (PT).”*

Source: Schwarz-Woelzl et al., 2016

*“The matrix allows the user to get the ‘big picture’ (FI) of SI by allowing the incorporation of the different stakeholders’ perspectives in a structured, systematic and transparent way (BG, CC, PT, SI UK). The stakeholders recognise the matrix to offer a ‘good overview’ (SI) about SI; hereby, the matrix makes it possible to structure and manage the SI while taking necessary contextual information into consideration. The matrix is considered as a ‘logically developed and structurally sound’ framework (BG), which takes into account ‘essential issues and aspects’ (FI) of SI. Moreover this approach invites innovators to think about the applicability of innovations in other areas and for other stakeholders (BG, CC) and permits to get a quick and structured overview about important implications for the management of SI (PT, UK).”*

*“The matrix is easily understandable (BG, CC, CZ, DE, FI, IT, SI, PL, UK) and its structure allows to ‘simplify and synthesise complex phenomena’ (IT) through the reduction via a step by step approach (DE, IT). Furthermore, the matrix is recognised as clear and readable (BG, CC, PL). Different stakeholders of one and the same SI may easily understand their role in the larger scope of a SI and its societal impact (CZ). Next, the matrix scheme was considered a ‘structured, systematic, and transparent approach’ (SI) in some of the stakeholder workshops (CC, BG, FI, SI). It was said that the matrix supports the simplification of complex processes through an easy-to-fill-in scheme (CC, IT, SI).”*

Source: Schwarz-Woelzl et al., 2016

MML Box 7: On multi-level advice

*“...an innovator perceived the actions on the tactical and operational levels very useful for the civil society stakeholder. For the other level and stakeholders the added value was considered less, but not useless as it helped to understand different perspectives. The matrix was considered useful to structure thoughts and include different perspectives, and to better understand the consequences of actions.”*

Source: Martin and Avarello, 2016

Tool Box 4: CASI-F tool for multi-level advice management

This Tool Box shows a screenshot of the fourth CASI-F tool supporting the multi-level advice management for SI initiatives. The tool is available for all registered CASI community members and can be accessed through the main navigation menu of the CASI portal on the main page of the CASI Actions Bank or by going to the following URL: <http://www.casi2020.eu/actions-bank/>. While most actions in the Actions Bank are automatically extracted from CASIPEDIA results, users can also access a separate input form and add actions by clicking on the 'add action' button without mapping a case.

The management of advice is structured around the three most common management levels of advice, namely: strategic (top-level management); tactical (mid-level management) and operational (front-line management).

In addition, during the fourth step of the CASI-F methodology, actions are targeted at the following four actors representing the quadruple helix of sustainable innovation (1) government, (2) business, (3) civil society and (4) research and education. The mapping of these actions can be conducted individually by the innovator (self-assessment), a trained mapper (CASI team member or country correspondent) or collectively by a group of experts or CASI community members invited to contribute to a given SI initiative. The following 10 SI key management aspects are considered in CASI-F: mobilisation, resources, foresight, momentum, aptitude, attitude, catalysis, fosterers, (multi-agent) transformations and (systemic) sustainability (see Table 8).

The fourth step of the CASI-F methodology is supported by the Actions Bank and related functionalities integrated into the Ideas Bank, both allowing actions to be nominated and assessed individually by the innovator (self-assessment), a trained mapper (CASI team member or country correspondent) or collectively by a group of experts invited to a given case. Nominated actions are assessed using the following five rating criteria: (1) importance to manage a given critical issue; (2) feasibility of implementation; (3) economic impact; (4) social impact; and (5) environmental impact. In addition, the tool allows to restrict the public visibility of individual actions.

## 5.5. Step 5: CASI-F protocols and tools for action roadmaps management

The complexity of the multi-level and multi-stakeholder approach led us to another major managerial conclusion: Critical issues require a systemic SI management framework. Using an innovation systems perspective a meta-analysis of the 1566 critical issues helped to identify 10 SI management key aspects associated with 50 critical factors or meta-issues affecting the **context, people, process and impact** of SI management dimensions (see Table 8, Glossary and Popper et al., 2016).

The success of a sustainable innovation depends greatly on its **context** and 17 critical factors were mapped against its four key aspects: Momentum, reflecting the potential space for innovation, i.e. expectations of entrepreneurs and other actors, political drive from regulators or procurement, exemplars from other technological or social enterprises, and the perception of problems that call for solutions; Foresight, showing the capacity to anticipate, strategise and overcome gaps in the innovation curve; Resources, emphasising the need for healthy combinations of skills, finance, location, markets, etc.; and Mobilisation, including the capacity for action, as in public participation, community and institutional support, public-private partnerships, research and education engagement.

The role of **people** – especially government, business, civil society, and research and education actors – cannot be under-estimated. Many objectives remain unfulfilled when innovations fail to connect or mobilise the right people, or do not provide the right incentives or skills for key people. Some eight critical factors were clustered around two key aspects in the people dimension: Aptitude, referring to the actual skill-set or competences of people involved in the design, development, implementation and diffusion of a sustainable innovation; and Attitude, meaning the type of behaviour of the same people.

Innovation is widely considered a complex, participatory and multifaceted process. As mentioned above, the analysis of critical issues confirmed the need for a multi-level and multi-stakeholder actions-oriented approach supporting the management of the innovation process. Given the multiple possibilities of clustering some 14 process-related critical factors, these have been grouped into two broader sets of key aspects: Catalysts, contributing to the initiation, development and implementation of the innovation; and Fosterers, including factors that further consolidate and diffuse the innovation.



Finally, 11 critical factors were linked to the impact dimension and grouped into two corresponding key aspects: (multi-agent) Transformation, meaning positive changes in the quadruple helix of SI and knowledge production (see also Carayannis and Campbell, 2009; 2010); and (systemic) Sustainability, referring to changes in the socio-technical system where the SI operates that lead to positive environmental, social, economic, government and infrastructure transformations without compromising the needs and welfare of future generations.

Table 8 summarises the four SI management dimensions, the 10 SI management key aspects and the 50 SI critical factors that innovators need to consider in the systemic management of SI actions (see Glossary).

*"The matrix allows the user to get the 'big picture' Can the qualitative 5-step approach improve the assessment and management of SI by complementing existing quantitative tools and methods (e.g. Life Cycle Assessment and derived sub-sets)? If so, how? "Definitely! To me it is a good example of the practical implementation of a multi-level governance approach, very well structured and implemented in a clear and consistent manner, giving a much broader perspective than Life Cycle Assessment and similar, which helps to better involve stakeholders."*

Source: MML Interview with Edgaras Leichteris – CASI Country Correspondent for Lithuania (Annexe 5)

MML Box 8: On how CASI-F complements quantitative SI assessments

|                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>CONTEXT dimension</b> | Momentum refers to the force that gets a sustainable innovation moving forward. There are 3 critical factors linked to this SI key aspect: political setting (including regulations, decisions, rules, policies, guidelines, etc.); exemplars (including pioneering or leading models, standards, prototypes, examples, etc.) and problems (including challenges, complications and difficulties as drivers of change).                                                                                                                                                                                                                                                                                                                                                                         | Foresight refers to the future-oriented strategic drive of a sustainable innovation. There are 3 critical factors linked to this SI key aspect: horizon scanning-based approach (proactive mapping of critical issues, e.g. barriers, drivers, opportunities and threats); trends-based approach (reacting to current developments); and strategic targets approach (aligning goals with STI priorities of the system). | Resources refer to the means that can be drawn by a sustainable innovation to be designed, developed implemented and diffused. There are 5 critical factors linked to this SI key aspect: geographical setting (both environmental and demographic conditions); funding (internal and external); infrastructure (physical and virtual); data (including hard and soft, e.g. statistics and insights) and scalability (potential to grow).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Mobilisation refers to the capacity to reach and involve key stakeholders. There are 6 critical factors linked to this SI key aspect: champions and facilitators (to engage stakeholders), civil society engagement (to promote democracy); government engagement (to ensure governance and regulation); research and education engagement (to promote evidence-based decision-making), business engagement (to promote public-private partnerships to address market issues) and proactive participation (to address the needs of the quadruple helix SI players). |
| <b>PEOPLE dimension</b>  | Aptitude refers to the actual skill set or competences of people involved in the design, development, implementation and diffusion of a sustainable innovation. There are 4 critical factors linked to this SI key aspect: leadership (to guide the innovation team); charisma (to inspire and mobilise key people); creativity (to reach original and innovative solutions); and knowledge (to make sound and informed decisions).                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                         | Attitude refers to the type of behaviour of people responsible for the design, development, implementation and diffusion of a sustainable innovation. There are 4 critical factors linked to this SI key aspect: enthusiasm (to spread interest and excitement); empathy (to be more responsive to the needs of potential SI users and beneficiaries); involvement (to promote cooperation and networking); and commitment (to achieve shared ownership and co-create success).                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>PROCESS dimension</b> | Catalysts refer to critical factors enabling the design and development phases of a sustainable innovation process. There are 7 critical factors linked to this SI key aspect: compressibility (to offer user-friendly solutions); crowd-sourcing (to achieve truly bottom-up financial support); learning-by-doing (to promote more assertive evolution and incremental innovation); supportive services (to deal with specific bottlenecks of the innovation process); absorptive capacity (to generate and act upon valuable information or intelligence); ex-ante impact evaluation (to recognise and measure important benefits and possible risks); and piloting and experimenting (to avoid disappointments and manage expectations).                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                         | Fosterers refer to critical factors supporting the implementation and diffusion phases of a sustainable innovation process. There are 7 critical factors linked to this SI key aspect: incentives (to further position the innovation); coordination (to manage the relationship between the innovation team, sponsors, supporters and beneficiaries); networking and synergy (to better capitalise momentum-related critical factors); knowledge management (to reinforce the innovation capacity of the team); intellectual property management (to improve the competitive advantage of the innovation); ex-post impact evaluation (to promote improvements through learning and demonstrate the positive environmental, social and economic impacts of an innovation); and communication and dissemination (to increase the sectoral and geographical transferability).                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>IMPACT dimension</b>  | (Multi-agent) Transformation refers to positive changes in the quadruple helix of SI and knowledge production. There are 6 critical factors linked to this SI key aspect: stakeholder and community development (to consolidate new/existing players and promote spin-offs and networking); knowledge-based products and services (to increase academic, cultural or scientific advances); values and lifestyle changes (to promote knowledge- and media-based cultural and behavioural change); multi-challenge approaches (to better manage the complexity of dynamically changing socio-technical systems, visions and paradigms); capacities and skills (to support workforce development, competences and jobs); and entrepreneurship (to innovate and create new business opportunities). |                                                                                                                                                                                                                                                                                                                                                                                                                         | (Systemic) Sustainability refers to changes in the socio-technical system in which the SI operates that lead to positive economic, social, infrastructure, environmental and government transformations. There are 5 critical factors linked to this SI key aspect (see Section 4.5): societal system sustainability (to improve social cohesion/ interaction, community sense, education); economic system sustainability (to improve consumption, production, labour conditions, trade); environmental system sustainability (to protect cultural/ecological heritage, species, resources, environmental protection laws and policies, etc.); government system sustainability (to improve public participation and democracy, etc.); and infrastructure system sustainability (to improve the energy, water and food supply system, waste management, settlements and cities, transportation, distribution and knowledge-transfer channels). |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

Table 8: CASI-F approach to SI management dimensions and key aspects

The lessons from the analysis of sustainable innovations were used to develop an action research methodology for piloting the CASI-F with real life sustainable innovations. The piloting process followed a critical issue approach, which required innovators to prioritise those critical issues (barriers, drivers, opportunities and threats) considered important and in need of urgent action. The most important critical issues were selected and, with the help of CASI partners, a total of 43 innovators engaged in a mutual learning, multi-level and multi-stakeholder 'action generation' process driven by creativity, evidence, expertise and interaction. At the time of writing this section, some 707 of these actions have been fully mapped and codified in the CASI Actions Bank, at <http://www.casi2020.eu/actions-bank/>.

Table 9 shows the overall results of the application of the CASI multi-level and multi-stakeholder actions-oriented approach to 43 sustainable innovations. More details about the actual implementation of the framework developed by the authors can be found in Hölsgens et al. (2017). In total, some 190 actions were generated for government actors, 186 actions for business actors, 175 actions for civil society actors and 156 actions for research and education actors. Overall, the actions were evenly distributed among actors and the three targeted SI management levels, namely strategic, tactical and operational (see also Table 7).

*Table 9: CASI-F approach to multi-level and multi-stakeholder actions mapping from 43 innovations*

| Multi-level & Multi-stakeholder Actions    | Government actors (190 actions) | Business actors (186 actions) | Civil society actors (175 actions) | Research and education actors (156 actions) |
|--------------------------------------------|---------------------------------|-------------------------------|------------------------------------|---------------------------------------------|
| Top-level management: Strategic actions    | 37%                             | 41%                           | 31%                                | 33%                                         |
| Mid-level management: Tactical actions     | 35%                             | 33%                           | 34%                                | 29%                                         |
| Front-line management: Operational actions | 28%                             | 26%                           | 35%                                | 38%                                         |

The subsequent application of the systemic SI management dimension (see Glossary) framework shows that 52% of the actions addressed the context dimension, 13% the people dimension, 25% the process dimension and 10% the impact dimension. The results confirm how important the context and process dimensions are in the management of critical issues influencing sustainable innovations. An interesting finding is the limited role of the impact dimension, probably as a result of the often long-term implementation nature of such actions.



*Figure 7: CASI-F approach to multi-stakeholder and multiple SI management dimension mapping*

The results also show the clear differences between government, and research and education actors in the management of critical issues in each of these dimensions. While government actions are expected to focus more on the context dimension, followed by the people, process and impact dimensions, the actions of research and education actors first target issues of the impact dimension, followed by the process, people and context ones.

These findings become more apparent and interesting after the application of the systemic action management framework at the level of 'key aspects' (Figure 8). Here we can clearly see the significant role of the mobilisation key aspect, followed by the fosterers and resources as the three most important areas of intervention. Both the foresight and sustainability key aspects appear to be addressed by all actors, although business actions in the foresight key action are considerably more prominent than those of other actors, showing that more strategic behaviour is normally expected from entrepreneurs. However, these results may also reveal the general need for a more forward-looking

and sustainability oriented-mentality when looking for solutions to critical issues affecting innovations. Figure 8 presents the distribution of each type of stakeholder by key aspect. Thus it is possible to recognise that government actors are expected to address critical factors linked to the momentum, mobilisation and resources key aspects. Business actors play a major role in the mobilisation key aspect as well as in actions dealing with issues about resources and fosterers.

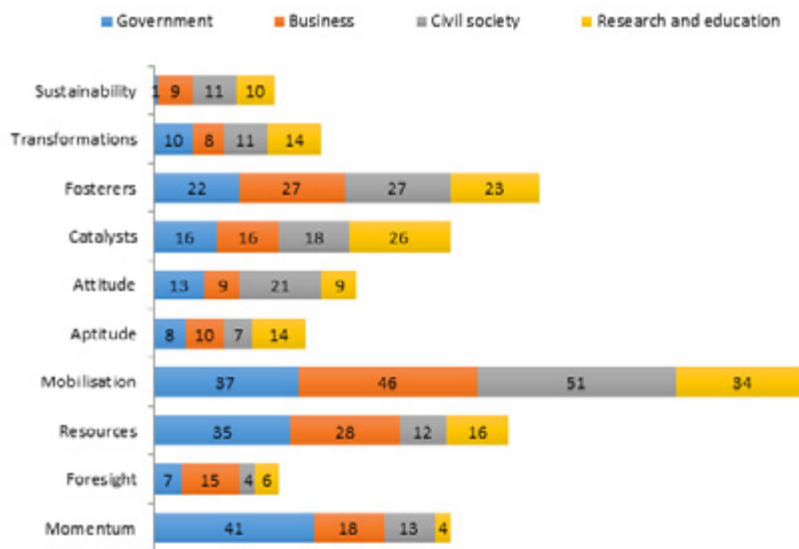


Figure 8: CASI-F approach to SI management key aspect mapping

From the innovators' perspective, the final step in the management of identified actions required their assessment in terms of importance for the innovator, feasibility of implementation and the degree of economic, social and environmental impacts. Several interviews and interactions with the innovators were organised in order to jointly prioritise those actions that required more in-depth managerial advice. This involved the creation of 46 action roadmaps using the systemic action management framework to develop more specific sub-actions or tasks for priority actions. A total of 564 tasks was generated and allocated short-medium-to-long-term implementation time scales, thus providing innovators with more practical advice on immediate and future steps for the management of critical issues affecting the context, people, process and impacts dimensions of their innovations. Figure 9 shows how the 564 tasks identified related to the context, people, process and impact dimensions, as well as their implementation time scale.

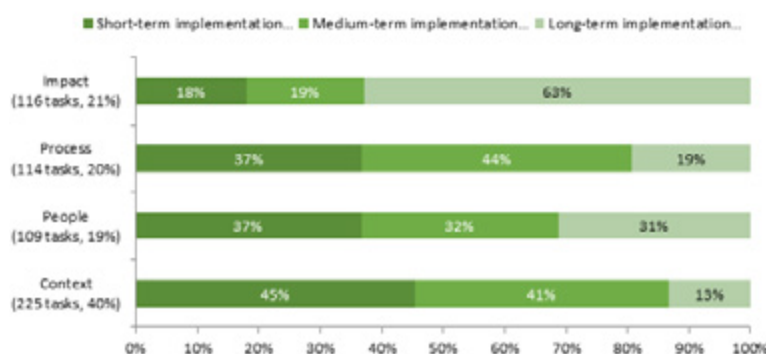


Figure 9: CASI-F approach to SI management dimension by implementation time frame

From the CASI team perspective, the amount of strategic intelligence generated while mapping, analysing and managing selected innovations and related critical issues has a huge potential to further advance knowledge and support evidence-based policy-making in the area of sustainable innovation.

From the CASI team perspective, the amount of strategic intelligence generated while mapping, analysing and managing selected innovations and related critical issues has a huge potential to further advance knowledge and support evidence-based policy-making in the area of sustainable innovation.

Applying supplementary systematic and content-oriented meta-analysis (i.e. a structured and systematic study of a large amount of data with the aim of identifying patterns and clusters) of the actions and sub-tasks linked to the piloted innovations could further support the refinement of CASI-F

and the development of recommendations on the type of mechanisms, schemes and programmes that regional, national and European policy-makers should put in place to: (1) better promote strategic sustainability agendas; and (2) promote more effective functioning of existing policy instruments.

Similarly, the meta-analysis of other SI Practices, Outcomes and Players assessment criteria would probably lead to more and equally interesting lessons. For example, a meta-analysis of innovators' short-medium-to-long-term objectives and aspirations was conducted. This helped to identify some 76 priority areas for product, service, social, organisational, governance, system and marketing innovations, which were later clustered into 10 research and innovation policy agendas.



*"Most of the feedback was positive, stating that action roadmaps are an interesting and useful tool. According to a large number of the innovators, the framework provides a different way of thinking about innovation project activities and to conduct an overall plan for the needed steps in innovation management. Quite a few of the innovators saw the roadmap being an efficient methodology to be used in workshops, especially when analysing more complex projects. The identification of a timeframe for each task was complimented as a good addition to the roadmap."*

*"The most positive responses indicated, that the activity made them consider questions that they never had considered before, and that the innovator could 'fully recommend the Action Road Map for others'."*

*"80% of the respondents thought that the overall process was satisfactory (57%) or highly satisfactory (23%). The innovators think the roadmap is a good way to ensure that you take all critical elements into account when planning future steps for innovation project. The words that were repeated in the questionnaire answers were 'structured', 'new' and 'interesting'." "Ultimately, 86% of the respondents considered that the Action Roadmap can help them in managing their sustainable innovation. Most of the innovators are planning to use their action roadmap tasks in the future. Furthermore, 77% of the innovators said they would consider following the recommendations."*

*"An overall perception was that the process of creating a roadmap was beneficial as it helped them in analysing their innovation management from a structured, new perspective."*

*"Almost all innovators (86%) considered that the Action Roadmap can help them in managing their sustainable innovation, whereas only a small minority (14%) felt that it does not provide added value."*

*"...77% of the innovators said they would consider following the recommendations, 6% would not and 17% were not sure. Ultimately, the findings suggest that even though the action roadmap is found usable by a vast majority of innovators, there are also innovators who find it less so, mainly due to external factors."*

*"...the roadmap is important for real-time management, as it 'supports new thinking especially because the situation/context of the initial sustainable innovation has changed with time'."*

*"Furthermore, the structured approach of the action roadmap process was found to facilitate fresh thinking on a familiar topic. There were several specific contexts identified that could be particularly useful for the roadmap methodology, e.g. schools, consultants and when starting new projects. One of the innovators thought that even though the presentation of the tasks in the matrix was not found very valuable, the tasks themselves are concrete and useful."*

*"In their feedback, the innovators mentioned that the activity was "very interesting" and that the process helped them in identifying and validating the elements and steps needed. It was suggested that the process might be particularly useful for group processes, design work and for improving the innovation impact. One respondent pointed out that they would be interested in creating more roadmaps for their other projects, too. In general, the innovators found the template to have clear arrangement and structure, but that the concepts required to be explained in order for them to complete the roadmap. In terms of how the benefits of the roadmap were understood by the innovators, the findings reveal some confusion about the ultimate advantage of completing an action roadmap. Many of the respondents recognised the structuring of the tasks to be the main benefit, as well as the conversation that comes as a side product of the activity. It was also pointed out that customisation to language, culture and stakeholder group would increase the benefits. One of the innovators wanted to emphasise the importance of adding Aptitude and Attitude to the concepts, as they are often neglected in the discussion."*

Source: Anttila, 2016

MML Box 9: On action roadmaps



## ACTIONS SUPPORTING SI MANAGEMENT DECISIONS

| LEVEL OF ACTION                                                                | ACTOR TYPE                                                 |
|--------------------------------------------------------------------------------|------------------------------------------------------------|
| <input type="checkbox"/> Top level management (strategic actions) (2)          | <input type="checkbox"/> Government (1)                    |
| <input type="checkbox"/> Middle level management (tactical actions) (4)        | <input type="checkbox"/> Business (3)                      |
| <input type="checkbox"/> Front-line level management (operational actions) (1) | <input type="checkbox"/> Civil society (2)                 |
|                                                                                | <input type="checkbox"/> Research and education actors (1) |

Civil society should recognise the importance of this sort of technologies so as to counteract as soon as possible the accumulated effects of past irresponsible behaviours

Level: Middle level management (tactical actions) | Actor type: Civil society  
Importance: Very high importance | Feasibility: Very high feasibility

[Related critical issues \(1\)](#)

EDIT ACTION

+ CREATE ROADMAP

#### Tool Box 5: CASI-F tool for action roadmaps management

The management of actions is facilitated by a package or set of sub-actions covering the four SI management dimensions (context, people, process, impact) and the 10 SI management key aspects (momentum, foresight, resources, mobilisation, aptitude, attitude, catalysts, fosterers, transformations and sustainability). Each sub-action is allocated a timeframe for implementation with the following options: short-term (up to 12 months), medium-term (between 12 to 24 months) and long-term (more 24 months).

This Tool Box shows a screenshot of the fifth CASI-F tool supporting the action roadmaps management for SI initiatives. The tool is only available for case (co)owners upon completion of the Step 4 of CASI-F (see Section 5.4 and Tool Box 4).

The fifth step of CASI-F methodology allows prioritised actions to be managed individually by the innovator (self-assessment), a trained mapper (CASI team member or country correspondent) or collectively by a group of experts invited to a given SI case.

← BACK    **CONTEXT**    PEOPLE    PROCESS    IMPACT

Increase staff's innovation management skills and capabilities  
Level: Top level management (strategic actions) | Actor type: Business

**A1. Momentum**

By **momentum** we mean the force that gets a sustainable innovation moving forward: (1) political setting (including regulations, decisions, rules, policies, guidelines, etc.); (2) exemplars (including pioneering or leading models, standards, prototypes, examples, etc.) and (3) problems (including challenges, complications and difficulties as drivers of change).

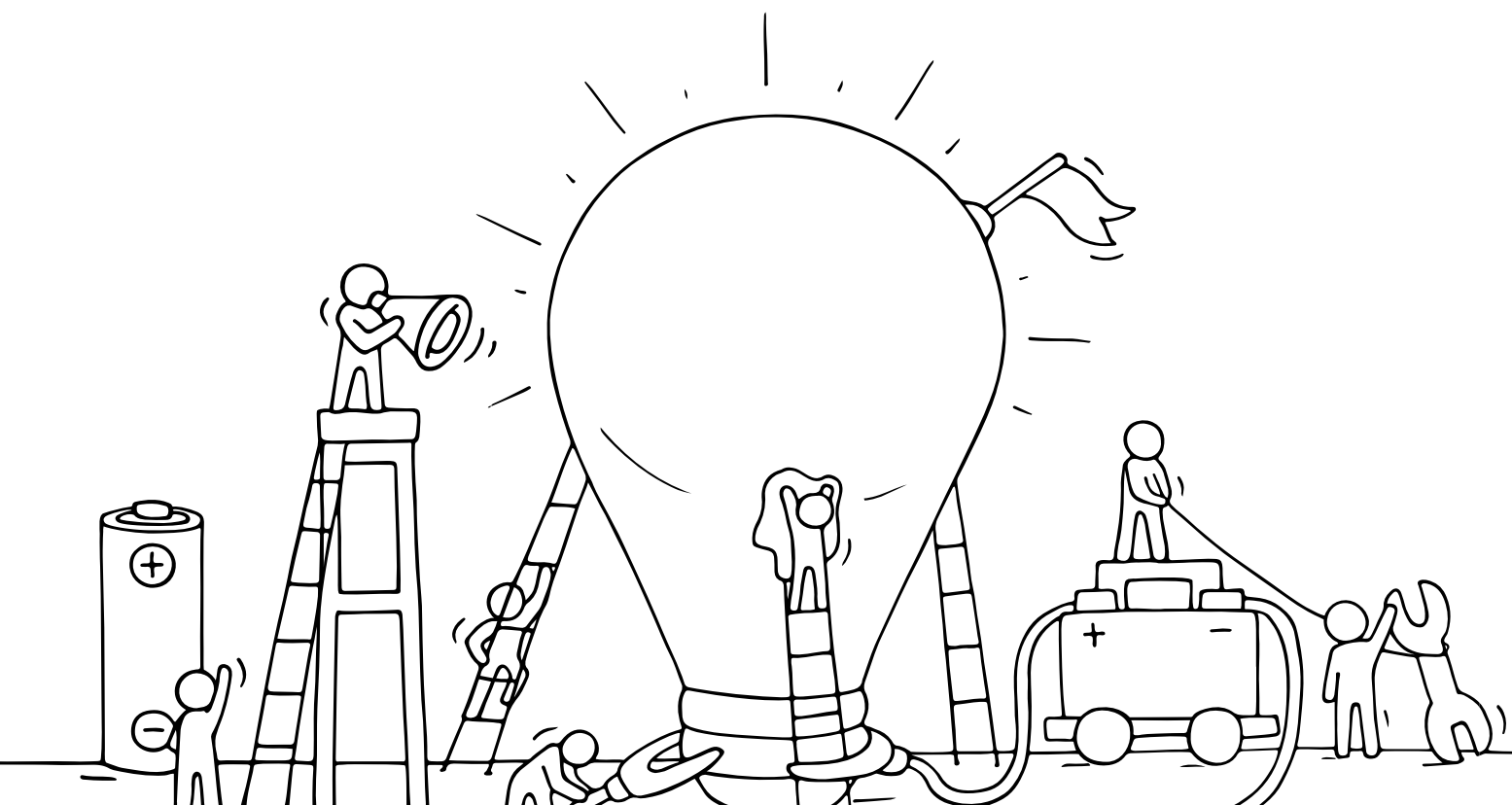
Identify and analyse database of existing innovation management programmes in international Business schools and attend to Education fairs

862 characters left

Timeframe for implementation: Medium-term

ADD ANOTHER

**A2. Foresight**



## 6. CASI-F in action

CASI-F has been successfully applied to support the sustainability assessment and management of 43 innovations of the seven different types: Social innovations (12 cases), Service innovations (11 cases), Organisational innovations (seven cases), Product innovations (five cases), Governance innovations (four cases), Marketing innovations (two cases) and System innovations (two cases). In terms of geographical scope, around 50% of the innovations were national, 30% local and 20% international. The most common sectors addressed by the innovations were education, energy, water, agriculture, ICT and health/social services.

A dedicated SI Pilots web space (<http://www.casi2020.eu/casipedia/si-pilots/>) has been created to feature these 43 SI cases in the CASI Portal (see Figure 10); however, the growing interest that different stakeholders have in future applications of CASI-F (see Section 7 and Annexe 5) means that additional cases will be implementing the full CASI-F methodology before and potentially after the end of the CASI project. The application of CASI-F to assist sustainability assessment and management of these innovations helped to produce **46 action roadmaps**:

- 12 roadmaps for social innovations;
- 11 roadmaps for service innovations;
- 8 roadmaps for organisational innovations;
- 6 roadmaps for product innovations;
- 4 roadmaps for governance innovations;
- 2 roadmaps for system innovations;
- 4 roadmaps for marketing innovations.

The successful application of CASI-F proves that the framework is versatile enough to assist such wide-ranging types of SI. Furthermore, the CASI-F five-step approach can lead to comprehensive assessment of critical issues in Steps 1-3 and targeted management of prioritised critical issues in steps 4 and 5. The following sections feature seven examples of the application of the CASI-F five-step approach to each of the above-mentioned seven types of sustainable innovations considered in the CASI project. Each example provides basic relevance assessment criteria (a full account of which can be found in the CASI portal

<http://www.casi2020.eu/casipedia/>, with examples of critical issues and action addressing one of the issues – prioritised by the innovator as most important and feasible – followed by an action roadmap fleshing out the implementation of the selected action.

In addition to the seven examples, there are 39 more roadmaps, which clearly demonstrate how CASI-F can be used as a practical MML tool to support multi-level (strategic, tactical and operational) transition management towards a more sustainability-oriented socio-technical system.

To promote the sustainability and deployment of CASI-F, the detailed steps of the framework, with practical examples and links to relevant tools within the CASI platform, will be accessible through a publicly available online training course developed around eight modules and 16 units, to be launched in April 2017. The CASI online training course will draw on the knowledge and results gained through various mutual learning activities and offering users a comprehensive overview of CASI-F's background, building blocks and application. Module 1 of the course will be dedicated to 'CASI-F in Action', reflecting on the practical aspects of the assessment and management elements of CASI-F.

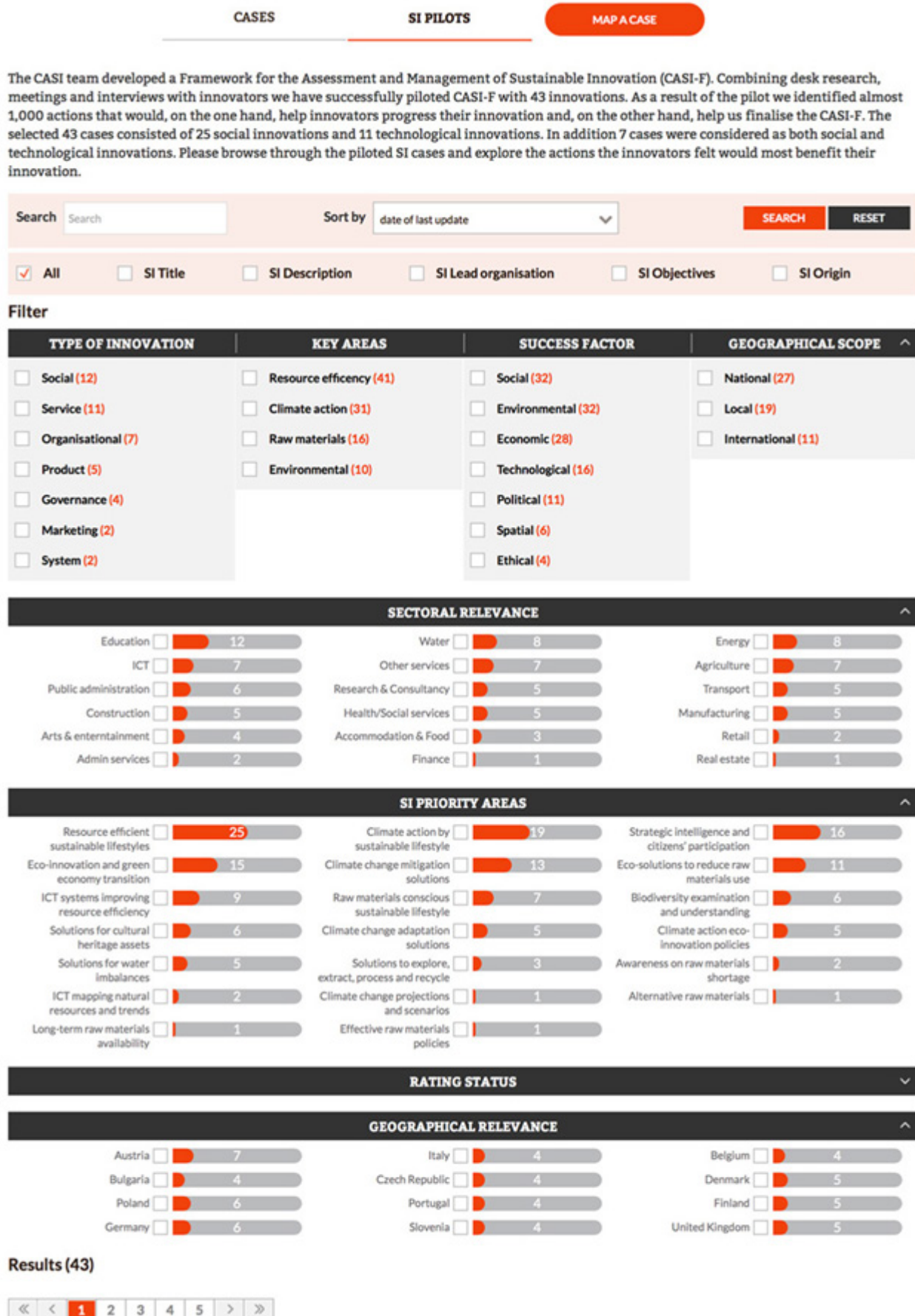


Figure 10: CASI-F SI Pilots section in the CASI Portal

## 6.1. CASI-F assisting sustainability transitions of 'product innovations'

This section provides an overview of the results of CASI-F applied to support the sustainability assessment and management of a product innovation. Below we outline the basic results from steps 1-3 of CASI-F.

### **WAI**

CASIPEDIA source: <http://www.casi2020.eu/casipedia/cases/1089>

#### SI Description

This product innovation aims to introduce to the international market a new technology for transforming agricultural, urban, industrial, and forestry waste into a new eco-material with outstanding mechanical and calorific characteristics. Its mechanical properties make the material very attractive as a substitute for wood and other natural resources, and its calorific features give the material great potential to be used as an eco-fuel.

#### SI Lead organisation

EnergiMidt Forsyning og Service A/S - Business actor

#### SI Objectives

- Develop a technology for transforming waste into an eco-material with remarkable calorific, mechanical and ecological characteristics
- Commercialise this technology to the waste treatment sector, both nationally and internationally
- Establish strategic alliances to commercialize the eco-material, through waste treatment entities, to electric power plants and high-energy-consumption industries (use of the material as an eco-fuel)
- Establish strategic alliances to commercialise the eco-material in the construction and derived sectors and to consumer-goods manufacturers (material used as a substitute for natural sources, e.g. wood)

#### Critical Issues



Commercial agreements (political driver): The potential markets (consumers) of the eco-material (i.e. markets to be directly addressed by the waste treatment entities, and eventually by WAI through strategic agreements) are: a) electric power plants introducing renewable and low-carbon alternatives in their systems and to increase their energy-production efficiency (apart from the high calorific properties, the homogeneity and malleability of the WAI eco fuel adds another important advantage in terms of electric production efficiency); b) industries requiring large amounts of energy in their production processes, such as paper-mills and the cement industry; c) consumer-goods manufacturers, construction firms and derived sectors aiming to substitute natural and non-renewable materials.



Environmental concerns and EU awareness (environmental driver): WAI's technology contributes to solving four European problems: (1) recovering urban and industrial wastes contributes to relieving the environmental pressure and ecosystem instabilities caused by the residues accumulated in landfill sites; (2) the use of the eco-material contributes to preserving natural resources (e.g. wood, coal) and reducing the use of plastics and non-recyclable materials; (3) the use of the material as a fuel constitutes a climate change mitigation action by the replacement of contaminant fossil fuels and reduction of CO2 emissions; (4) the renewable material will contribute to making the transition to a reliable, affordable, publicly accepted, competitive and sustainable European energy system, with less dependence on international imports.



Limited capacity for international expansion (social barrier): The company should reinforce the international network and the necessary skills for internationalisation.

Some eight critical issues were identified together with the innovator and the following SI Critical Issue 'Limited capacity for international expansion' (social barrier) was prioritised and considered for step 4 of CASI-F. Seven SI Management Actions were identified and the innovator prioritised the following action: 'Increase staff innovation management skills and capabilities' (strategic action). Finally, step 5 of CASI-F required the co-creation of an action roadmap for the prioritised action.

*SI Management Box 1: CASI-F for 'product innovation' management: WAI (SP)*

|                                      |                                                                                                                                                                                                      |                                                                                                                                                         |                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                       |
|--------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>SI Management Action</b>          | Increase staff innovation management skills and capabilities                                                                                                                                         |                                                                                                                                                         |                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                       |
| <b>Action Type</b>                   | Top level management (strategic action) - Initiate (carry out tasks never done in the past)                                                                                                          |                                                                                                                                                         |                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                       |
| <b>Relevant actor</b>                | Business actor (Innovator)                                                                                                                                                                           |                                                                                                                                                         |                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                       |
| <b>CONTEXT dimension sub-actions</b> | <b>MOMENTUM</b><br>Identify and analyse database of existing innovation management programmes in international business schools and attend education fairs<br><br><b>Timeframe:</b> Medium-term      | <b>FORESIGHT</b><br>Identify emerging management skills and capacities in the sector, through journals, conferences<br><br><b>Timeframe:</b> Short-term | <b>RESOURCES</b><br>Apply to local/national funds for management skills development<br><br><b>Timeframe:</b> Medium-term                                                          | <b>MOBILISATION</b><br>Establish new contacts with local/ regional business schools, and researchers dealing with management skills and capabilities development (become a case study in schools) and incorporate action research in the company<br><br><b>Timeframe:</b> Medium-term |
| <b>PEOPLE dimension sub-actions</b>  | <b>APTITUDE</b><br>Create an internal repository to facilitate knowledge transfer within the company, differentiating management skills from technical education<br><br><b>Timeframe:</b> Short-term |                                                                                                                                                         | <b>ATTITUDE</b><br>Foster staff creativity with participatory workshops, e.g. generate future actions through highly-transformed scenarios<br><br><b>Timeframe:</b> Long-term     |                                                                                                                                                                                                                                                                                       |
| <b>PROCESS dimension sub-actions</b> | <b>CATALYSTS</b><br>Involve key stakeholders in piloting and experimenting with the firm's innovation phases<br><br><b>Timeframe:</b> Short-term                                                     |                                                                                                                                                         | <b>FOSTERERS</b><br>Establish incentive procedures to reward staff professional development<br><br><b>Timeframe:</b> Medium-term                                                  |                                                                                                                                                                                                                                                                                       |
| <b>IMPACT dimension sub-actions</b>  | <b>TRANSFORMATIONS</b><br>Analyse staff potential and training objectives in relation to local jobs and competences<br><br><b>Timeframe:</b> Short-term                                              |                                                                                                                                                         | <b>SUSTAINABILITY</b><br>Develop staff education plans for the employers' family so as to bring together professional and personal development<br><br><b>Timeframe:</b> Long-term |                                                                                                                                                                                                                                                                                       |

## 6.2. CASI-F assisting sustainability transitions of ‘service innovations’

This section provides an overview of the results of CASI-F applied to support the sustainability assessment and management of a service innovation. Below we outline the basic results from steps 1-3 of CASI-F.

### RUSZ Reparatur

CASIPEDIA source: <http://www.casi2020.eu/casipedia/cases/751>

#### SI Description

RUSZ is a social enterprise that initiated changes in EU policies. Its primary objectives are resource efficiency and social inclusion. RUSZ provides repair services for household appliances, consumer electronics and ICT. It sells certified, high-quality used equipment as well as new washing machines that were diagnosed in the in-house R&D department as particularly durable and easily repairable. From 1998 to 2007, RUSZ was commissioned by the Viennese labour market authority, AMS. RUSZ was successfully transformed into a non-profit private enterprise in 2008 and now operates on a cost-recovery basis and employs more than 20 (mostly former long-term unemployed) people. RUSZ has been leading many initiatives, to replicate its model and also to overcome the barriers it is facing and change policies, both in Austria and Europe. RUSZ was among the initiators of the Austrian umbrella organization RepaNet and its EU equivalent RREUSE.I.

#### SI Lead organisation

RUSZ Verein zur Förderung der Sozialwirtschaft (Austria)

#### SI Objectives

- Achieve an economic advantage of reliable repair services and the creation of green jobs
- Contribute to waste prevention: By repairing old machines RUSZ makes an essential contribution to electronic scrap prevention. By repairing more than five million kilograms of electrical appliances in the last 18 years, RUSZ has contributed to resource conservation, climate protection and waste avoidance
- Fight against the metastases of the economic system, such as planned obsolescence: RUSZ deplores the fact that many electrical and electronic devices are designed to be replaced within five years. It works on the development of a white list of long-lasting and repair-friendly new drives
- Provide education for unemployed people: RUSZ not only offers jobs, it also provides the chance of technical training
- Offer a broad array of second life-devices with warranty
- Offer quality high-standard yet low-cost repair services
- Provide customers with reliable information about possible alternatives

#### Critical Issues



**Planned obsolescence (technological threat):** High-level planned obsolescence means ever more goods are designed in a way which makes them increasingly difficult to repair and ever more manufacturers do not stock up on spare parts.



**Re-integration of long-term unemployed into society (social driver):** RUSZ has a high success rate of re-integrating long-term unemployed people back into society. It trains them to be service technicians and even helps them with financial and social issues, e.g. by supporting citizens in finding new housing.



**Austrian tax system (political barrier):** Repairing is labour-intensive work, thus repair costs are high. Repairing goods can be considered to be taxed twice: high employment taxes plus VAT. This is definitely a barrier for creating new jobs. Socio-environmental tax reform should be put in place.

Some 10 critical issues were identified together with the innovator and the following SI Critical Issue 'Planned obsolescence' (technological threat) was prioritised and considered for step 4 of CASI-F. Thirty-eight SI Management Actions were identified and the innovator prioritised the following action: 'Support the EC by implementing the circular economy (CE)' (strategic action). Finally, step 5 of CASI-F required the co-creation of an action roadmap for the prioritised action.

*SI Management Box 2: CASI-F for 'service innovation' management: R.U.S.Z Reparatur (AT)*

|                                      |                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                     |
|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>SI Management Action</b>          | Support the EC by implementing the circular economy (CE)                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                     |
| <b>Action Type</b>                   | Top level management (strategic action) – Reinforce (enhanced existing actions)                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                     |
| <b>Relevant actor</b>                | Business actor (Innovator)                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                     |
| <b>CONTEXT dimension sub-actions</b> | <b>MOMENTUM</b><br>Elaborate a franchise manual for CE business models.<br><br><b>Timeframe:</b><br>Medium-term                                                                                                                                                                                                                                                                                 | <b>FORESIGHT</b><br>Identify emerging 'hot topics' in EC strategy (collaboration synergies), i.e. European Economic & Social Committee, JRC, EEA).<br><br><b>Timeframe:</b><br>Long-term | <b>RESOURCES</b><br>Apply for publicly funded projects together with research organisations.<br><br><b>Timeframe:</b><br>Medium-term                                                                                                                                                                                                                                                   | <b>MOBILISATION</b><br>Establish contacts with local adult education Institutions to implement and further elaborate educational programmes.<br><br><b>Timeframe:</b><br>Short-term |
| <b>PEOPLE dimension sub-actions</b>  | <b>APTITUDE</b><br>Transfer knowledge and intellectual capital on the CE within the enterprise.<br><br><b>Timeframe:</b> Short-term                                                                                                                                                                                                                                                             |                                                                                                                                                                                          | <b>ATTITUDE</b><br>Activate staff to participate in activities related to the CE, e.g. repair-cafes.<br><br><b>Timeframe:</b> Short-term<br><br>Ensure continued education of the staff about CE through PR activities.<br><br><b>Timeframe:</b> Short-term<br><br>Ensure identification of the staff with the concept of CE through PR activities<br><br><b>Timeframe:</b> Short-term |                                                                                                                                                                                     |
| <b>PROCESS dimension sub-actions</b> | <b>CATALYSTS</b><br>Provide an assessment of contributions of the RUSZ to the CE (e.g. common goods balance sheet).<br><br><b>Timeframe:</b> Short-term                                                                                                                                                                                                                                         |                                                                                                                                                                                          | <b>FOSTERERS</b><br>Use existing networks to foster the implementation of a CE.<br><br><b>Timeframe:</b> Short-term<br><br>Identify new stakeholders relevant to the implementation of a CE and build up networks with them.<br><br><b>Timeframe:</b> Long-term                                                                                                                        |                                                                                                                                                                                     |
| <b>IMPACT dimension sub-actions</b>  | <b>TRANSFORMATIONS</b><br>Elaborate a franchise manual for CE business models and disseminate it to relevant actors (e.g. business universities).<br><br><b>Timeframe:</b> Long-term<br><br>Collaborate with international students, scientists and universities to spread the idea and foster the implementation of societal transformation towards a CE.<br><br><b>Timeframe:</b> Medium-term |                                                                                                                                                                                          | <b>SUSTAINABILITY</b><br>Monitor internal procedures regarding their compliance with sustainability on all levels (e.g. common goods balance sheet).<br><br><b>Timeframe:</b> Long-term                                                                                                                                                                                                |                                                                                                                                                                                     |

## 6.3. CASI-F assisting sustainability transitions of ‘social innovations’

This section provides an overview of the results of CASI-F applied to support the sustainability assessment and management of a product innovation. Below we outline the basic results from steps 1–3 of CASI-F.

### Transition Now

CASIPEDIA source: <http://www.casi2020.eu/casipedia/cases/1114>

#### SI Description

In February 2013 the Danish green think-tank CONCITO and the newspaper Dagbladet Information hosted a seminar for 50 young people interested in the numerous challenges that surround our society today: climate change, resource depletion, environmental degradation, financial crisis, economic crisis, unemployment and social unrest. During the seminar, participants had the chance to analyse the situation in depth and to come up with creative, innovative, pragmatic and radical ideas. They continued their cooperation after the seminar and established Transition Now, which became an independent entity. As such, Transition Now (Omstilling Nu) positioned itself as a network and a project platform that works to create transition to a sustainable future society. This requires action, innovation and not least a common effort from both politicians and citizens. The network aims to provide an opportunity for open interdisciplinary dialogue related to new sustainable solutions. It includes activities such as large-scale seminars, monthly debate cafes and guidelines for citizens, all focused on how to move towards a sustainable society.

The main aim of Transition Now is to provide a new way of organising green advocacy work. It was not intended to be just another green organisation and therefore it was established as an ‘open source network’ with a central coordinating group and communication structure (webpage and email newsletters) which provides opportunities for people with visions, ideas and will to get together and coordinate activities.

#### SI Lead organisation

Omstilling Nu / Transition Now (Denmark)

#### SI Objectives

- Create a transition to a sustainable future society
- Provide a platform for dialogue between citizens, professionals, academia and politicians

#### Critical Issues



**Financial resources (economic threat):** As Transition Now is an NGO, it does not get any financial support from the government, and does not have any financial sponsors. It gets support for office facilities, but it also need money for flyers, campaigns, etc. Growth will be difficult! It can involve new volunteers, but if they cannot find financial support it will be hard to run new campaigns or host events.



**Goodwill (social opportunity):** Transition Now receives a lot of goodwill from its partners and from society, because it focuses on sharing knowledge and supporting other organisations and helping them with their ideas. All that goodwill serves as an opportunity for Transition Now to grow.



**Pass on the know-how (social barrier):** There are 20–30 core members who have been in Transition Now since the beginning. Early on working for many hours was not an issue as the network members were studying and didn’t have other jobs. However, currently many of them have work and children, and therefore they find it difficult to find the time and energy for voluntary work. If the network is to thrive in the future, it is important to transfer all the know-how to its new members.

*SI Assessment Box 3: CASI-F for ‘social innovation’ assessment: Transition Now (DK)*

Some eight critical issues were identified together with the innovator and the following SI Critical Issue 'Goodwill' (social opportunity) was prioritised and considered for step 4 of CASI-F. Eight SI Management Actions were identified and the innovator prioritised the following action: 'Private companies could develop strategies for how they can integrate sustainability as a core value in their business, together with Transition Now' (strategic action). Finally, step 5 of CASI-F required the co-creation of an action roadmap for the prioritised action.

*SI Management Box 3: CASI-F for 'service innovation' management: Transition Now (DK)*

|                                      |                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                  |
|--------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>SI Management Action</b>          | Private companies could develop strategies for how they can integrate sustainability as a core value in their business, together with Transition Now                                                                                                                                                          |                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                  |
| <b>Action Type</b>                   | Top level management (strategic action) – Recover (repeat actions done in the past)                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                  |
| <b>Relevant actor</b>                | Civil society (Innovator)                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                  |
| <b>CONTEXT dimension sub-actions</b> | <p><b>MOMENTUM</b><br/>Read the report: Potential for Denmark as a Circular Economy. This can be used as a tool to make contact with relevant companies. And it reveals some of the barriers/ opportunities to a sustainable transition in Denmark.</p> <p><b>Timeframe:</b><br/>Short-term</p>               | <p><b>FORESIGHT</b><br/>Read recent reports about green entrepreneurship in Denmark to learn about (1) the future demand for a platform for green entrepreneurs, (2) guidelines on starting a new company and (3) ways to network with other entrepreneurs.</p> <p><b>Timeframe:</b><br/>Short-term</p> | <p><b>RESOURCES</b><br/>Involve the members and their network in Transition Now, to find project funding opportunities.</p> <p><b>Timeframe:</b><br/>Short-term</p>                                                                                                      | <p><b>MOBILISATION</b><br/>Develop better communication channels for the organisation, so it will be easier to 'call for action' when there is a need for more people to be involved in the project.</p> <p><b>Timeframe:</b><br/>Short-term</p> |
| <b>PEOPLE dimension sub-actions</b>  | <p><b>APTITUDE</b><br/>Find people to make presentations with knowledge and charisma, who can lead and motivate new entrepreneurs.</p> <p><b>Timeframe:</b> Short-term</p>                                                                                                                                    |                                                                                                                                                                                                                                                                                                         | <p><b>ATTITUDE</b><br/>Identify and recruit people who are very enthusiastic and involved in the idea of making a platform, which can help new green entrepreneurs. A special education or skillset is not necessarily required.</p> <p><b>Timeframe:</b> Short-term</p> |                                                                                                                                                                                                                                                  |
| <b>PROCESS dimension sub-actions</b> | <p><b>CATALYSTS</b><br/>Submit applications for financial support.</p> <p><b>Timeframe:</b> Short-term</p>                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                         | <p><b>FOSTERERS</b><br/>Seek existing activities pursuing a similar idea and try to partner with them</p> <p><b>Timeframe:</b> Short-term</p>                                                                                                                            |                                                                                                                                                                                                                                                  |
| <b>IMPACT dimension sub-actions</b>  | <p><b>TRANSFORMATIONS</b><br/>To be sure that there will be a green transition, parameters and guidelines need to be developed and used to measure and guide the companies along the green track in a five-year period after they have been involved in the project.</p> <p><b>Timeframe:</b> Medium-term</p> |                                                                                                                                                                                                                                                                                                         | <p><b>SUSTAINABILITY</b><br/>Support the new green entrepreneurs who want to create a more sustainable society.</p> <p><b>Timeframe:</b> Medium-term</p>                                                                                                                 |                                                                                                                                                                                                                                                  |

## 6.4. CASI-F assisting sustainability transitions of 'organisational innovations'

This section provides an overview of the results of CASI-F applied to support the sustainability assessment and management of an organisational innovation. Below we outline the basic results from steps 1-3 of CASI-F.

### Tempo al Tempo

CASIPEDIA source: <http://www.casi2020.eu/casipedia/cases/956>

#### SI Description

The Municipality of Monza has been actively restructuring and integrating services and facilities (e.g. schools with more eco-friendly public mobility) as well as improving accessibility to public services by increasing the availability of online services. The main goal of the Tempo al Tempo initiative is to improve access to city services through the development of the number of services available online. This also requires the decentralisation of the access points to municipality services. Through a series of organisational changes, Tempo al Tempo aims to create a decentralised and integrated system that improves access to the city services and facilities such as public services, schools or administrative practices. Other supporting innovations include exploitation of the apps already used to create an integrated system tailor-made for citizens, potential changes to the daily behaviour of citizens, the creation of an integrated system to access services and facilities for citizens, as well as new policies with a strong commitment from major and other stakeholders.

#### SI Lead organisation

Municipality of Monza (Italy) - Government actor (Regional / Local body)

#### SI Objectives

- Save citizens time by offering them the opportunity to better manage their daily needs and tasks
- Improve access to services and facilities
- Change the public administration organisational culture
- Avoid traffic congestion and therefore pollution in town
- Optimise municipality workers' time
- Avoid traffic congestion and therefore pollution in the city

#### Critical Issues



**Promises not kept (political threat):** Announcing a programme of overall change in the field of public services and then being able to realise only a minimum part of such a programme. Difficulties in turning the programme into concrete actions.



**Lack of technological infrastructure (technological barrier):** The initiative needs reliable technology in order to support the digitalisation and the decentralisation of services. At the moment there are trained contact persons, but the technological solutions are not yet ready.



**Public administration culture (political opportunity):** Changing the relational culture of the Public Administration (PA).

*SI Assessment Box 4: CASI-F for 'organisational innovation' assessment: Tempo al Tempo (IT)*

Some nine critical issues were identified together with the innovator and the following SI Critical Issue 'Public administration culture' (political opportunity) was prioritised and considered for step 4 of CASI-F. Seven SI Management Actions were identified and the innovator prioritised the following action: 'Involve civil society as a driving force to accelerate the changes: adoption and strengthening of bottom up approach, the *Bilancio partecipato*' (strategic action). Finally, step 5 of CASI-F required the co-creation of an action roadmap for the prioritised action.

*SI Management Box 4: CASI-F for 'organisational innovation' management: Tempo al Tempo (IT)*

|                                      |                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                              |
|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>SI Management Action</b>          | Involve civil society as a driving force to accelerate the changes: adoption and strengthening of bottom up approach, the <i>Bilancio partecipato</i>                                                                                                                                                 |                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                              |
| <b>Action Type</b>                   | Top level management (strategic action) – Reinforce (Enhanced existing actions)                                                                                                                                                                                                                       |                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                              |
| <b>Relevant actor</b>                | Regional government                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                              |
| <b>CONTEXT dimension sub-actions</b> | <b>MOMENTUM</b><br>Explore existing best practices that have already applied the <i>Bilancio Partecipato</i> (e.g. Parma, Milano, Gallarate etc.). This aims to capitalise on best solutions and reduce existing weaknesses.<br><br><b>Timeframe:</b> Short-term                                      | <b>FORESIGHT</b><br>React positively to a new awareness widespread at societal level: citizens willing to participate and offer their contributions.<br><br><b>Timeframe:</b> Short-term | <b>RESOURCES</b><br>Ensure that public funding is consistent with the real needs of citizens by reducing the waste of resources and exploiting data to better understand how and where to allocate them.<br><br><b>Timeframe:</b> Short-term                                                                   | <b>MOBILISATION</b><br>Obtain community support by establishing a new agreement of mutual benefit with local civil associations to involve as many citizens as possible.<br><br><b>Timeframe:</b> Short-term |
| <b>PEOPLE dimension sub-actions</b>  | <b>APTITUDE</b><br>Ensure the implementation of creative processes to carry out innovative solutions, providing a new leadership style focused on implementation of a cooperative environment and sharing a new concept supporting more informed decision-making.<br><br><b>Timeframe:</b> Short-term |                                                                                                                                                                                          | <b>ATTITUDE</b><br>Promote cooperation and networking between all civil society actors in working groups focused on specific issues (immigration, family etc). For instance, more public workshops to look for and share the innovative solution.<br><br><b>Timeframe:</b> Short-term                          |                                                                                                                                                                                                              |
| <b>PROCESS dimension sub-actions</b> | <b>CATALYSTS</b><br>Involve citizens in decisions about the allocation of public funding. The Public Administration (PA) promotes a new way to define the priorities (bottom-up) and a proactive capacity since citizens are involved in the designing process.<br><br><b>Timeframe:</b> Short-term   |                                                                                                                                                                                          | <b>FOSTERERS</b><br>Ensure visibility of the best projects selected within the <i>Bilancio Partecipato</i> . Ensure that the process for realizing the <i>Bilancio partecipato</i> (bottom-up) becomes a consolidated praxis with a major and real impact on daily issues.<br><br><b>Timeframe:</b> Short-term |                                                                                                                                                                                                              |
| <b>IMPACT dimension sub-actions</b>  | <b>TRANSFORMATIONS</b><br>Generate new knowledge about PA operations by understanding bottlenecks or issues which result from citizens' lack of commitment, but from issues in the national or regional legal system.<br><br><b>Timeframe:</b> Medium-term                                            |                                                                                                                                                                                          | <b>SUSTAINABILITY</b><br>Ensure adequate budget to implement the <i>Bilancio Partecipato</i> on an annual basis, by encouraging a crowd-funding approach to increase financial resources for the nominated projects.<br><br><b>Timeframe:</b> Medium-term                                                      |                                                                                                                                                                                                              |

## 6.5. CASI-F assisting sustainability transitions of 'governance innovations'

This section provides an overview of the results of CASI-F applied to support the sustainability assessment and management of a governance innovation. Below we outline the basic results from steps 1–3 of the framework.

### Innovation Fur

CASIPEDIA source: <http://www.casi2020.eu/casipedia/cases/993>

#### SI Description

Innovation Fur is an initiative launched by the island of Fur, Skive municipality, and EnergiMidt. The vision is to transform Fur into a miniature model of the sustainable society of the future where modern technology is utilised to achieve a green profile. Innovation Fur is a 'Living Lab' – a means to explore innovative possibilities between public and private actors. Innovation Fur enables a unique partnership between a group of dedicated citizens, a municipality with green ambitions, and a private company with experts on energy and fibre optics. The initiative aims to inspire citizens, municipalities, regions, and politicians through a continuous dialogue with scientists, investors, and companies interested in testing new technology on Fur.

#### SI Lead organisation

EnergiMidt Forsyning og Service A/S – Business actor

#### SI Objectives

- To be CO<sub>2</sub>-neutral (within the energy and transport sector) by 2020.
- To produce an annual climate impact report.
- To have 25,000 more visitors to the island in 2020 compared to 2010 figures.
- To have high-speed internet via fibre in all homes on Fur.
- To achieve behavioural change among the inhabitants of Fur in order to seek energy-efficient and CO<sub>2</sub>-neutral solutions.
- To contribute to the development of a sustainable welfare society in the future by demonstration of: modern technology; digitalisation of public service, healthcare and education; energy-saving solutions.
- To be a source of inspiration for citizens, municipalities, cooperatives, politicians, scientists, and investors.

#### Critical Issues



**From idea to useful product (social barrier):** In the long process of implementing an innovation and of testing products and services, it can be hard for the citizens in the rest of the municipality to wait for the benefits. There are many small problems and barriers in a huge process like Innovation Fur. It is therefore important that there is a strong steering committee that can solve the problems early in the process.



**The law on land management – Planloven (political barrier):** Achieving the objectives, e.g. of increasing the proportion of renewable energy in the system, is a challenge. The issue is that in Denmark there is a planning law (Planloven on land management, which concerns, among other things, where it is legal to erect new buildings. For example, is it not legal to build close to the coast. The project is on an island and therefore it is difficult to find areas where it is legal to place bigger wind turbines and solar power plants.



**Empowerment of citizens (social opportunity):** As a result of the innovation, the citizens on Fur have stronger networks, tools and knowledge.

Some eight critical issues were identified together with the innovator and the following SI Critical Issue 'Empowerment of citizens' (social opportunity) was prioritised and considered for step 4 of CASI-F. Eight SI Management Actions were identified and the innovator prioritised the following action: 'Developing strategies about ways to maintain or increase the citizen's engagement in further development of new sustainable technologies' (strategic action). Finally, step 5 of CASI-F required the co-creation of an action roadmap for the prioritised action.

*SI Management Box 5: CASI-F for 'governance innovation' management: Innovation Fur (DK)*

|                                      |                                                                                                                                                                                      |                                                                                                                                                                                                               |                                                                                                                                                                                                                    |                                                                                                                                                                                                                                              |
|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>SI Management Action</b>          | Developing strategies about ways to maintain or increase the citizen's engagement in further development of new sustainable technologies                                             |                                                                                                                                                                                                               |                                                                                                                                                                                                                    |                                                                                                                                                                                                                                              |
| <b>Action Type</b>                   | Top level management (strategic action) – Recover (repeat actions done in the past)                                                                                                  |                                                                                                                                                                                                               |                                                                                                                                                                                                                    |                                                                                                                                                                                                                                              |
| <b>Relevant actor</b>                | Business (Innovator)                                                                                                                                                                 |                                                                                                                                                                                                               |                                                                                                                                                                                                                    |                                                                                                                                                                                                                                              |
| <b>CONTEXT dimension sub-actions</b> | <b>MOMENTUM</b><br>Continue and further develop the strong image universities and the industry have of EnergiMidt and Innovation Fur.<br><br><b>Timeframe:</b><br>Medium-term        | <b>FORESIGHT</b><br>Scan for weak signals and potential wild cards related to the various roles citizens can play in the development of a sustainable welfare society.<br><br><b>Timeframe:</b><br>Short-term | <b>RESOURCES</b><br>Estimate the optional amount of resources (both time and funding) needed to promote citizen engagement and dialogues between universities and industry.<br><br><b>Timeframe:</b><br>Short-term | <b>MOBILISATION</b><br>Strengthen the cooperation Innovation Fur has with universities and industry. This can help to mobilise the shareholders (all customers are also shareholders of EnergiMidt).<br><br><b>Timeframe:</b><br>Medium-term |
| <b>PEOPLE dimension sub-actions</b>  | <b>APTITUDE</b><br>Divide the stakeholders (customers) into different groups according to geographical location or by type of stakeholder.<br><br><b>Timeframe:</b> Short-term       |                                                                                                                                                                                                               | <b>ATTITUDE</b><br>Strengthen communication and PR. It is important to communicate the positive stories and show the ongoing process to the shareholders.<br><br><b>Timeframe:</b> Short-term                      |                                                                                                                                                                                                                                              |
| <b>PROCESS dimension sub-actions</b> | <b>CATALYSTS</b><br>Divide the stakeholders (customers) into different groups according to geographical location or by type of stakeholder.<br><br><b>Timeframe:</b> Medium-term     |                                                                                                                                                                                                               | <b>FOSTERERS</b><br>Strengthen communication and PR. It is important to communicate the positive stories and show the ongoing process to the shareholders.<br><br><b>Timeframe:</b> Short-term                     |                                                                                                                                                                                                                                              |
| <b>IMPACT dimension sub-actions</b>  | <b>TRANSFORMATIONS</b><br>Involve the shareholders more in the company and allow them to be a bigger part of the innovation and development work.<br><br><b>Timeframe:</b> Long-term |                                                                                                                                                                                                               | <b>SUSTAINABILITY</b><br>Develop clear and user-friendly guidelines for the sustainable promotion of networks, tools and knowledge supporting Innovation Fur strategies.<br><br><b>Timeframe:</b> Short-term       |                                                                                                                                                                                                                                              |

## 6.6. CASI-F assisting sustainability transitions of 'system innovations'

This section provides an overview of the results of CASI-F applied to support the sustainability assessment and management of a system innovation. Below we outline the basic results from steps 1-3 of CASI-F.

### Passive House Kindergarten

CASIPEDIA source: <http://www.casi2020.eu/casipedia/cases/1208>

#### SI Description

Gabrovo Municipality is a leader in Bulgaria regarding the implementation of energy efficiency practices. Seven schools, 10 kindergartens and a nursery feature in the projects of the municipality where energy efficiency measures have been introduced. The kindergarten 'Sun' was built to the passive house standard. For many years SolAir has participated in international projects in cooperation with its partners from the Center for Energy Efficiency (EnEffect) where the two companies have developed different theoretical models. The first steps in the implementation of energy efficiency measures in real buildings were made in 2007, with the reconstruction of the former department store in the town of Pravets into an office building and a high-tech laboratory for research and experimentation. The building featured efficiency indicators twice as high as those prevailing at the time that met the requirements adopted after years of Class A buildings for energy efficiency. Innovative for Bulgaria and Gabrovo, the project sets new standards and presents a model to educate and encourage citizens to implement energy efficiency measures. The construction work was in seven months. The planning of the building was assigned to the architectural studio SolAir International Ltd, assisted by EcoEnergy and EnEffect. With the implementation of the project the team members were certified by the Passive House Institute. After testing the air-tightness, detailed inspection of all project documentation and all construction materials and technological equipment directly related to energy consumption for heating and ventilation, the building was certified as a 'passive house' by the Darmstadt Institute. This is the first building in Bulgaria awarded this highly prestigious certificate. By constructing a kindergarten under passive house standards Gabrovo Municipality has introduced a new conceptual approach to buildings/construction works in Bulgaria, where environmental awareness meets reduced and optimised maintenance costs and at the same time keeps the focus on healthy lifestyles. This is an example for Bulgaria of the steps needed in this area for sustainable development in particular for the construction of new schools, kindergartens and public buildings.

#### SI Lead organisation

Gabrovo Municipality – Government actor (Regional/Local body)

#### SI Objectives

- To increase energy efficiency in buildings and thus reduce their environmental impact.
- To support an economic development that is in line with the principles of sustainability and efficient use of natural resources.

#### Critical Issues



**Adoption of a new construction model (spatial opportunity):** The benefit/opportunity from showcasing the advantages of passive house kindergartens provides the possibility of adopting the model and approving it as a standard in construction of such buildings.



**Energy costs and resource efficiency trends in the construction industry (economy driver):** Environmental awareness and healthcare, energy efficiency, economically sound construction projects.



**Improved child healthcare (environmental opportunity):** Better conditions, educational effect – explaining the benefits and raising environmental awareness

Some four critical issues were identified together with the innovator and the following SI Critical Issue 'Adoption of a new construction model' (spatial opportunity) was prioritised and considered for step 4 of CASI-F. Twenty-three SI Management Actions were identified and the innovator prioritised the following action: 'Undertake a systematic awareness-raising campaign of the need for a Nearly Zero Energy Building (NZEB) application that provides outreach to vast groups of potential users' (strategic action). Finally, step 5 of CASI-F required the co-creation of an action roadmap for the prioritised action.

*SI Management Box 6: CASI-F for 'system innovation' management: Passive House Kindergarten (BG)*

|                                      |                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                      |
|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>SI Management Action</b>          | Undertake a systematic awareness-raising campaign of the need for a Nearly Zero Energy Building (NZEB) application that provides outreach to vast groups of potential users                                                                                                                                     |                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                      |
| <b>Action Type</b>                   | Top level management (strategic action) – Reinforce (enhanced existing actions)                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                      |
| <b>Relevant actor</b>                | Business (Innovator)                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                      |
| <b>CONTEXT dimension sub-actions</b> | <p><b>MOMENTUM</b><br/>Orientate towards bottom-up approaches to convince first the end users and other stakeholders of the need to adopt the NZEB standards as a way to influence the government.</p> <p><b>Timeframe:</b><br/>Short-term</p>                                                                  | <p><b>FORESIGHT</b><br/>Design an awareness raising campaign for the end-users of NZEB Buildings</p> <p><b>Timeframe:</b><br/>Short-term</p> <p>Design an educational campaign for the stakeholders – students, educators, young professionals and industry practitioners.</p> <p><b>Timeframe:</b><br/>Short-term</p> | <p><b>RESOURCES</b><br/>Scan for suitable calls for grants and mobilise own resources and partners, including specialised high schools to submit proposals for funding and joint forces.</p> <p><b>Timeframe:</b><br/>Short-term</p>                                  | <p><b>MOBILISATION</b><br/>Design a communication and engagement model (partnership agreements, ambassador and co-organiser programmes) to engage different stakeholders and span an awareness and educational campaign centered on demo NZEB buildings.</p> <p><b>Timeframe:</b><br/>Short-term</p> |
| <b>PEOPLE dimension sub-actions</b>  | <p><b>APTITUDE</b><br/>Use creativity-stimulating formats in the building of marketing strategy, strategy for investment attraction, etc.</p> <p><b>Timeframe:</b> Short-term</p>                                                                                                                               |                                                                                                                                                                                                                                                                                                                        | <p><b>ATTITUDE</b><br/>Engage external mentors/trainers in educational events/formats to build proper knowledge and understanding among team members.</p> <p><b>Timeframe:</b> Short-term</p>                                                                         |                                                                                                                                                                                                                                                                                                      |
| <b>PROCESS dimension sub-actions</b> | <p><b>CATALYSTS</b><br/>Thoroughly research and interact (initiate talks) with local ecosystem players to determine the potential key partnerships.</p> <p><b>Timeframe:</b> Short-term</p>                                                                                                                     |                                                                                                                                                                                                                                                                                                                        | <p><b>FOSTERERS</b><br/>Design partnership programme and communication strategy to leverage the synergy between the core team external partners, supporters and collaborators.</p> <p><b>Timeframe:</b> Short-term</p>                                                |                                                                                                                                                                                                                                                                                                      |
| <b>IMPACT dimension sub-actions</b>  | <p><b>TRANSFORMATIONS</b><br/>Set long-term goals together with the short-and medium-term ones and engage the partners and contributors around them. Define and use different approaches that best suit every stakeholder engaged at the corresponding level of action.</p> <p><b>Timeframe:</b> Short-term</p> |                                                                                                                                                                                                                                                                                                                        | <p><b>SUSTAINABILITY</b><br/>Put the emphasis on practical examples through demo buildings, samples and simulations to help the audience 'get the feeling' of NZEB and visualise the economic and environmental effect of it.</p> <p><b>Timeframe:</b> Short-term</p> |                                                                                                                                                                                                                                                                                                      |

## 6.7. CASI-F assisting sustainability transitions of 'marketing innovations'

This section provides an overview of the results of CASI-F applied to support the sustainability assessment and management of a marketing innovation. Below we outline the basic results from steps 1-3 of the framework.

### **ECOverified**

CASIPEDIA source: <http://www.casi2020.eu/casipedia/cases/6358>

#### **SI Description**

ECOverified® is a filed Certification Mark in the European Union and trademarked under classes 35 and 41. It was established based on an ambition for a greener future, specialising in providing unique environmental and energy assessments. ECOverified summarises the results of these assessments in the form of an Ecolabel and also certifies products and services so that it can provide a complete ecological package for the hospitality industry. ECOverified is also creating and participating in social causes. ECOverified provides high-level consultation delivered by a skilled team of doctoral researchers, MBA graduates and senior engineers in the following sectors: greenhouse emission point (ISO 14067), human health and eco-toxicity (REACH and US EPA), life cycle assessment (ISO 14040-44), biodiversity and resource consumption, corporate social responsibility (Ethics, ILO, ISO 8000 & Devel Programs) and By-Product Synergy (BPS).

#### **SI Lead organisation**

ECOverified (Greece) – Research & education actor (Private research and innovation support organisation)

#### **SI Objectives**

- To provide unique environmental and energy assessments.
- To create an Ecolabel for the participating businesses.
- To certify products and services as eco-friendly, in cooperation with universities.
- To advertise hotels that have gained our Ecolabel in online booking agents such as familygoesout, booking.com, etc.
- To create an NGO that will have a social impact by participating in causes such as 'Adopt a tree in Greece', food for the refugees, 3D printed accessories, etc. To give holidaymakers the chance to adopt sea turtles, see them and learn about them.
- To create an application that will map eco-friendly locations and businesses. Greece will be the starting point, hoping to expand that to other countries as well
- To find alternative solutions for regions where recycling is not carried out, i.e. small islands.
- To create a map with all the eco-related activities that are available.

#### **Critical Issues**



**Green investment (economic opportunity):** Green marketing motivates hotels so that they can invest in green solutions.



**Green solutions (environmental opportunity):** More and more people are interested in the environment and as a result they can motivate companies to apply green solutions.



**Economic crisis (economic threat):** Because of the economic crisis many companies are interested in green solutions but can't afford to invest money in sustainable solutions. Also sometimes raw materials have a very low cost, which makes it unsustainable from an economic point of view to purchase environmentally-friendly products.

Some 12 critical issues were identified together with the innovator and the following SI Critical Issue 'Green solutions' (environmental opportunity) was prioritised and considered for step 4 of CASI-F. Eight SI Management Actions were identified and the innovator prioritised the following action: 'Establish an effective partnership strategy that involves reputable endorsing/certifying institutions and other influential tourism sector actors' (tactical action). Finally, step 5 of CASI-F required the co-creation of an action roadmap for the prioritised action.

*SI Management Box 7: CASI-F for 'marketing innovation' management: ECOverified (GR)*

|                                      |                                                                                                                                                                                                         |                                                                                                                                                                                                                                       |                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                        |
|--------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>SI Management Action</b>          | Establish an effective partnership strategy that involves reputable endorsing/certifying institutions and other influential tourism sector actors                                                       |                                                                                                                                                                                                                                       |                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                        |
| <b>Action Type</b>                   | Middle level management (tactical action) – Initiate (new task never undertaken in the past)                                                                                                            |                                                                                                                                                                                                                                       |                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                        |
| <b>Relevant actor</b>                | Business (Innovator)                                                                                                                                                                                    |                                                                                                                                                                                                                                       |                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                        |
| <b>CONTEXT dimension sub-actions</b> | <b>MOMENTUM</b><br>Participate in enterprise competition to support the development of ECOverified digital platform.<br><br><b>Timeframe:</b><br>Short-term                                             | <b>FORESIGHT</b><br>Scan for ICT trends in cloud services in order to build an ECOverified cloud solution, which both hotels and their guests are motivated to apply to sustainable solutions.<br><br><b>Timeframe:</b><br>Short-term | <b>RESOURCES</b><br>Take part in a funding competition sponsored by Microsoft and developers.<br><br><b>Timeframe:</b><br>Short-term                                                                              | <b>MOBILISATION</b><br>Make use of ECOverified members on Facebook where people are informed about sustainable solutions via videos and info graphics; we intend to educate the public. Apply for cooperation with Carbon Footprint companies.<br><br><b>Timeframe:</b><br>Medium-term |
| <b>PEOPLE dimension sub-actions</b>  | <b>APTITUDE</b><br>Share knowledge regarding sustainable solutions focusing on hotels and their guests.<br><br><b>Timeframe:</b> Medium-term                                                            |                                                                                                                                                                                                                                       | <b>ATTITUDE</b><br>Apply a positive approach by speaking about ECOverified on Athens radio stations to motivate economic and ecologic targets.<br><br><b>Timeframe:</b> Short-term                                |                                                                                                                                                                                                                                                                                        |
| <b>PROCESS dimension sub-actions</b> | <b>CATALYSTS</b><br>Create a video for crowd-sourcing and to stimulate the public.<br><br><b>Timeframe:</b> Short-term                                                                                  |                                                                                                                                                                                                                                       | <b>FOSTERERS</b><br>Keep taking part in MIT's Enterprise Forum's competition for funding so that the public can be motivated via incentives.<br><br><b>Timeframe:</b> Short-term                                  |                                                                                                                                                                                                                                                                                        |
| <b>IMPACT dimension sub-actions</b>  | <b>TRANSFORMATIONS</b><br>Use the ECOverify platform to motivate the public via the hospitality industry so that sustainable solutions can become lifestyle changes.<br><br><b>Timeframe:</b> Long-term |                                                                                                                                                                                                                                       | <b>SUSTAINABILITY</b><br>Develop communication and promotional material on how the ECOverified platform can support the ECONomy, ECOlogy and social sustainability in general.<br><br><b>Timeframe:</b> Long-term |                                                                                                                                                                                                                                                                                        |

# 7. CASI-F impacts and benefits

During the life of the CASI project there have been numerous planned and unplanned positive results from the various activities that led to the development, implementation and dissemination of CASI-F. In this section we will be highlighting some of the most important impacts and benefits of CASI-F.

## 7.1. Impacts of CASI-F

- Five-step approach to sustainable innovation assessment and management – a clear and easy to apply approach that takes innovators or mappers through a detailed relevance assessment and scanning of, in this case, sustainable innovation initiatives, to multi-criteria analysis and assessment of SI initiatives. This is followed by the analysis and assessment of critical issues (barriers, threats, opportunities and drivers) that have the potential, either directly or indirectly, to influence the developments around a given innovation. Two more steps which are part of the management element of CASI-F are multi-level advice through the elaboration of actions for four types of stakeholders at three levels of management (strategic, tactical and operational), followed by a more detailed roadmap – sub-actions for a prioritised action – structured around four SI management dimensions and 10 SI management key aspects (see Table 8 and the Glossary).
- CASI-F positioned as a versatile framework supporting sustainability oriented processes – the versatile nature of CASI-F has been recognised within CASI when applied to seven different types of innovations, but also in different contexts and thematic areas that are outside CASI's scope, thus increasing the usability of the framework and its impact potential.
- New EC & MS-level project proposals using CASI-F as a conceptual and methodological framework – several project proposals, for EC and national funding, were submitted in order to further deploy and exploit the application of CASI-F in various contexts, as well as to promote the sustainability of CASI-F.



- New conference abstracts and papers using CASI-F as a conceptual and methodological framework – in order to increase the outreach and impact of CASI-F among scientific communities, its conceptual and methodological framing was used to elaborate conference abstracts and papers. More recently two abstracts were submitted to the 2017 Annual Conference of the EU-SPRI Forum: ‘The Future of STI Policy’ in Vienna.
- Successful application of CASI-F in the CASI project (e.g. 43 pilots producing 46 action roadmaps) – the CASI framework was pre-piloted in two municipalities (Monza in Italy and Espinho in Portugal) and piloted by project partners in 12 EU countries (three to four pilots per country), resulting in successful support of SI initiatives by providing multi-level advice and sub-actions for the key management aspects of SI.
- Successful application of CASI-F outside the CASI consortium (e.g. around 20 cases from university students/researchers in Italy) – throughout the duration of the project CASIPEDIA (CASI’s bank of sustainable innovation initiatives) gained popularity among research and education actors, mainly as a source of case studies for lecturers. More recently, however, active public engagement has been noted as some 20 new cases of sustainable innovation were mapped in CASIPEDIA, and CASI-F was applied to those initiatives by students and researchers in Italy.
- Positive feedback and endorsements from the users of CASI-F, who further promote the application of the framework in different thematic, institutional and geographical contexts. Their testimonies are available in Annexe 5 and on the CASI web portal.

## 7.2. Benefits of CASI-F

This section presents the benefits of CASI-F for the quadruple helix of sustainable innovation stakeholders.

| Benefits of CASI-F     | CASI-F Track 1 Innovations                                                                                                                                                                                                                                                                                                  | CASI-F Track 2 Policies                                                                                                                                                                                                                                                                               | CASI-F Track 3 Aspirations                                                                                                                                                                                                                                  |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Government             | Explore SI practices in the local/national/international area of policy influence. Implement policies that address specific critical issues or SI considerations. Establish the conditions that allow the implementation of actions by SI firms. Include new research priorities in the SI agenda.                          | Incorporate new policy insights into the policy formulation process. Cover policy gaps, develop new policies and review existing ones. Be inspired by policy briefs and blogs to formulate new SI policies.                                                                                           | Understand citizens' expectations and fears. Address citizens' opportunities, threats and suggestions in policy formulation. Adjust research and innovation funding to citizens' proposed agendas.                                                          |
| Business               | Identify opportunities. Learn from competitors. Refine/define SI strategies. Reinforce SI management. Implement actions, meta-actions. Create roadmaps, based on piloted SI cases.                                                                                                                                          | Design contingency plans that allow the right answers to new policy plans and regulations. Identify strategic opportunities and responses to identified policy insights and gaps. Take advantage of new regulation opportunities or prevent the negative impact of new policy developments.           | Align products and services to citizens' interests. Consider citizens' opportunities, threats and suggestions in corporate strategies. Increase R&I investment according to new research priorities.                                                        |
| Civil Society          | Discover products, services, and social initiatives. Recognise those SI management factors where public engagement is needed, thus participating in socially oriented business activities. Be aware of new research and innovation agendas and priorities.                                                                  | Use policy briefs and blogs to be better informed about current policy agendas. Identify and understand through the policy blog individuals' most desired policy developments, and make strategies accordingly. React to policy briefs with information on positive and negative policy changes.      | Define civil society organisations' strategies to citizens' expectations. Initiate new actions related to identified citizens' opportunities, threats and suggestions. Align civil institutions' strategies to citizens' priorities.                        |
| Research and Education | Use CASIPEDIA and SI indicators to support lectures and research. Include SI critical factors in business schools' courses. Compare SI critical issues across countries and sectors in management research. Develop training courses and research careers in areas related to CASI R&I policy agendas on SI (see Annexe 2). | Include policy briefs and blog insights in policy analysis-related lectures. Use policy briefs and policy blogs to expand insights on specific areas of policy research, thus broadening research empirical data. Undertake research in those policy directions identified in policy briefs and blog. | Utilise citizens' visions in lecturing or foresight and horizon scanning projects and courses. Make further research areas in areas related to citizens' opportunities, threats and suggestions. Create new lecture areas according to citizens' interests. |

Table 10: CASI-F benefits by type of stakeholder

The possible uses of applying CASI-F in the assessment and management of innovations, policies and aspirations is summarised in Table 10. However, using our systematic effort to apply CASI-F to the innovations first track, here we provide a more elaborated discussion on how government, business, civil society and research and education actors can benefit from the information, analysis and advice generated during the piloting of CASI-F.

- Government actors can use the information from the mapping to explore practices in the local, national or international areas of policy influence. The resulting analysis can support the implementation of multiple policies addressing, for example, specific technological, economic, environmental, political, social, ethical or spatial critical issues. The advice linked to the actions generated can help policy actors to establish the conditions that allow the implementation of SI actions by firms and include new research priorities in SI agendas.
- Business actors can use the information from the mapping to identify opportunities and learn from competitors. The resulting analysis can support the (re)definition of SI strategies and reinforcement of SI management, while the advice would, on the one hand, facilitate the implementation of actions and meta-actions and, on the other hand, help to create roadmaps based on piloted SI cases.
- Civil society actors can use the information from the mapping to discover new products, services and social initiatives. The resulting analysis would allow civil society organisations (CSOs) to recognise those SI management factors where public engagement is needed, thus increasing their participation in socially oriented business activities. The advice generated from the analysis of innovations can increase CSOs' awareness of new research and innovation agendas and priorities.
- Research and education actors can use the information from the mapping as case studies in lectures and research on sustainable innovation or to develop new SI databases and statistics. The resulting analysis can inform management programmes on SI critical factors in business schools, and management research on how SI critical factors compare across countries. The advice linked to the actions generated can drive research careers through new research priorities.

*What is the added value of conducting such exercise? For students, lecturers, innovators and for sustainability/innovation oriented courses in general?*

*"In my opinion, the most positive and interesting things for the students are:*

- *The application of CASI-F to a real case is considered a good opportunity to learn by doing, in a way that is better and more interactive than the traditional and largely theoretical lessons.*
- *Practically applying CASI-F not only enhances the ability of students to analyse SI cases, it also forces students to critically analyse the case and to use reason when proposing possible solutions for SI development.*
- *The students feel they are doing something that could be useful not only for them, but also for the innovator (who may benefit from receiving feedback and proposals for the development of their innovation).*
- *They are proud to be 'involved', to contribute, and to do what researchers and professors from UNIMIB have done themselves, in an EC-funded research project (i.e. CASI)."*

*Source: MML Interview with Mattia Martini – Researcher at the University of Milano-Bicocca (Annexe 5)*

*MML Box 10: On the added value of CASI-F for research and education*

# 8. CASI-F key achievements, H2020 relevance and the way forward

This report has presented a comprehensive overview of the CASI framework (CASI-F) for the assessment and management of sustainable innovation. Major attention has been paid to the development of multi-level advice, building upon a practical/methodological sequence, which includes scanning, selecting, mapping, and analysing sustainable innovation initiatives. In this final section, we will focus our attention on key achievements during the revision and finalisation of CASI-F, *Horizon 2020 relevance and the way forward*.

## 8.1. Key achievements

- On the Mobilisation and Mutual learning (MML) for CASI-F: The journey towards the finalisation of CASI-F is a good example of a collective mobilisation and mutual learning process, where CASI partners in 12 EU countries (AT, BE, BG, CZ, DE, DK, FI, IT, PL, PT, SI, UK), together with country correspondents in the other 16 Member States and a network of 40+ innovators were engaged in the co-creation and crowdsourcing of solutions to critical issues raised by the Societal Challenge on Climate Action, Environment, Resource Efficiency and Raw Materials (SC5). The CASI-F driven MML process helped to promote the incorporation of science in society by integrating multiple knowledge sources and multi-stakeholder perspectives (including those of citizens and sustainability experts) into the assessment of critical issues (see Sections 4.3, 5.3 and Figure 6 above) and the better management of sustainable innovations that embrace societal concerns and needs (see stakeholder interviews in Annexe 5).
- On the Formal Products of CASI-F: As stated in the CASI Description of Work (DoW) (2015), the main objective of the project has been the development of CASI-F as “a methodological framework for assessing sustainable innovation and managing multi-disciplinary solutions through public engagement in the research, technology development and innovation (RTDI) system, by ensuring the commitment of a broad spectrum of societal stakeholders into its implementation, including industry, policy-makers, research organisations and academia, civil society organisations and the general public.” To achieve such methodological framework, the authors have developed five sets of complementary steps for the assessment and management of SI. Therefore, in practical terms, CASI-F consists of five interconnected sets of protocols and tools (Sections 5 and 6):
  1. Protocols and tools for sustainability relevance and scanning, i.e. identifying SC5-relevant innovations, policies and aspirations;
  2. Protocols and tools for multi-criteria analysis and assessment, i.e. selecting or prioritising nominated innovations, policies and aspirations using a set of criteria relevant to SC5 and MML priorities;
  3. Protocols and tools for critical issue analysis and assessment, i.e. analysing selected innovations, policies and aspirations so as to identify and prioritise critical issues, such as barriers, drivers, opportunities and threats;
  4. Protocols and tools for multi-level advice management, i.e. generating and prioritising multi-level and multi-stakeholder actions to manage prioritised critical issues; and
  5. Protocols and tools for action roadmaps management, i.e. developing roadmaps for the most important and urgent actions.

- On the By-products of CASI-F: The numerous activities around the conceptual and methodological design, piloting, implementation and diffusion of CASI-F led to significant impacts (Section 7) and by-products, some of which were planned in the DoW, such as the methodological framing and execution of 43 CASI pilots. However, there are equally important 'unplanned' by-products that deserve to be mentioned, such as the top 10 recommendations for R&I Policy Agendas on SI (see Annexe 2) and the integration of the Visions Bank and Actions Bank into CASIPEDIA and CASI-F.

## 8.2. H2020 relevance

- On CASI-F for Excellent Science: Both the CASI-F methodology and its 'by-products' (including CASIPEDIA, Ideas Bank, Actions Bank, Visions Bank and the supporting CASI Tutorial and other web-based Policy Watch-related modules, such as the CASI Blog and CASI Library of Documents and Policy Briefs) can be seen as state-of-the-art e-infrastructures capable of fostering Europe's innovation potential and human capital. They do this by: (1) introducing forward-looking approaches to address critical issues (potentially) hampering or boosting the sustainability of SI, and (2) promoting a multi-stakeholder and bottom-up approach to the development of the right set of aptitudes and attitudes among innovators, sponsors, brokers and beneficiaries of SI. In this sense, the widespread use of CASI-F in the assessment and management of SI will almost certainly help the EU R&I system to become more competitive on a global scale.
- On CASI-F for Industrial Leadership: There are several ways in which CASI-F can contribute towards the H2020 pillar of industrial leadership. First, by including product, service, social, organisational, governance, system and marketing innovations, CASI-F can stimulate all forms of innovation in SMEs and large businesses. Second, by promoting the development of 'action roadmaps' around SI management dimensions (context, people, process and impact) and SI management key aspects (see Section 5.5, Table 8 and Glossary), CASI-F can strengthen and increase the innovation capacity of industrial actors to contribute to economic growth and the quality of life of European societies. Third, by encouraging a multi-systemic sustainability assessment and management, CASI-F can help to monitor and promote positive transformations in economic, societal, environmental, infrastructure and government systems (see Section 4.5 and Figure 4 above).
- On CASI-F for Societal Challenges: CASI-F has been designed, piloted, implemented and promoted to address SC5. However, the versatility of its five-step approach to the assessment and management of critical issues shaping the future of such a wide range of innovations suggests that CASI-F could be easily adapted and applied to the other European SCs. These are: Health, demographic change and wellbeing; Food security, sustainable agriculture and forestry, maritime and inland water research, and the bioeconomy; Secure, clean and efficient energy; Smart, green and integrated transport; Europe in a changing world; and Secure societies. In fact, an adaptation of CASI-F protocols (Section 5) has been used in successful proposals (for an Innovation Centre in Australia, for Forest-based Bioeconomy Areas in Uruguay and for RRI), thus showing the potential for further methodological developments of CASI-F in the future.

## 8.3. The way forward

- On CASI-F for Unsustainable Innovations: One area for further research is using CASI-F to assess and manage failure by promoting mutual learning from the critical issues and actions of failing or failed innovations. Indeed, some of the mapped and piloted cases may not be sustainable in the future.
- On CASI-F for Early Stage Innovations: Another open research question is whether CASI-F can help innovations at their conceptual and prototyping stages. In CASI we focused mainly on successfully implemented or diffused cases, thus the protocols and tools would need to include some ex ante impact assessment criteria, should CASI-F be applied to concepts and demonstration activities too.
- On CASI-F for Global Value Networks: In an increasingly globalised world a systemic assessment and management of the interconnection between several innovations would need to be incorporated into CASI-F in order to deliver sustainable value to end-users in a wide range of business areas.
- On the future of CASI-F protocols and tools: Regardless of the maintenance costs of CASI-F, its future would benefit from a new step incorporating ISO sustainability standards and quantitative assessment methods and tools (e.g. LCA) as either a preliminary task or as a cross-cutting activity complementing all the steps of CASI-F (see Foreword).

# 9. CASI-F Glossary

## CASI Actions Bank

An action or advice co-creation tool that explores ways in which critical issues may be managed at strategic, tactical and operational levels, and develops policy roadmaps for prioritised actions. The Actions Bank promotes more systematic and multi-level advice management for SI initiatives. The tool is available for all registered CASI community members and can be accessed through the navigation menu of the CASI portal on the main page of the CASI Actions Bank or by going to the following URL: <http://www.casi2020.eu/actions-bank/>. While most actions in the Actions Bank are automatically extracted from CASIPEDIA results, users can also access a separate input form and add actions by clicking on the 'add action' button without mapping a case. The management of advice is structured around the three most common management levels of advice: strategic (top-level management); tactical (mid-level management); and operational (front-line management). In addition, during the fourth step of CASI-F methodology, actions are targeted at the following four actors representing the quadruple helix of sustainable innovation: (1) government; (2) business; (3) civil society; and (4) research and education. The mapping of these actions can be conducted individually by the innovator (self-assessment), a trained mapper (CASI team member or country correspondent) or collectively by a group of experts or CASI community members invited to contribute to a given SI initiative.

## CASI Ideas Bank

An idea (aka critical issue) co-creation and management tool, which draws on over 500 Sustainable Innovation cases from across Europe and the world. Of these, the 202 most CASI-relevant cases were selected for further analysis, which helped gather a wide range of ideas that contributed to the co-creation of the CASI Ideas Bank. These ideas or critical issues represent existing and potential barriers, drivers, opportunities and threats that can influence the success (i.e. uptake, implementation or diffusion) of sustainable innovation. The tool is available for all registered CASI community members and can be accessed through the main navigation menu of the CASI portal, by clicking on the 'add an idea' button on the main page of the CASI Ideas Bank. The mapping of these critical issues can be conducted individually by the innovator (self-assessment), a trained mapper (CASI team member or country correspondent) or collectively by a group of experts or CASI community members invited to contribute to a given SI initiative. The following seven categories of ideas are considered in CASI-F: technological, economic, environmental, political, social, ethical and spatial.

## CASI Visions Bank

A vision is a picture or imagination of a desirable future, which may be based upon hopes and dreams - but also upon concerns and fears in relation to problems or imagined threats that are not desirable. The aim of the Visions Bank is twofold: (1) to openly share the results of a highly participatory citizens engagement process resulting in 50 visions on sustainable futures, with a time span of 30-40 years from now, developed during CASI citizen panels in the following 12 EU countries: Austria, Belgium, Bulgaria, Czech Republic, Denmark, Finland, Germany, Italy, Poland, Portugal, Slovenia and the United Kingdom; and (2) to activate the vision-based track of the CASI framework for the assessment and management of sustainable innovation (CASI-F) so as to allow for a systematic mapping of critical issues (barriers, drivers, opportunities and threats) associated with SI visions, and to promote a more public assessment and management of possible actions linked to such issues. The Visions Bank allows for further exploration of the original 50 visions created in CASI citizen panels, but it also allows CASI community members to add their own vision to the Visions Bank and to share their views about the most critical issues associated with that vision.

## CASIPEDIA

A unique bank of sustainable innovation initiatives mapped by the CASI project, where activists, experts and supporters of sustainability agendas can find various initiatives combining the environmental, economic and social dimensions of sustainability. CASIPEDIA supports the mapping of practices, outcomes and players related to seven types of SI, namely product, service, social, organisational, governance, system or marketing innovations.

## Common

This refers to something that is done or shared by two or more (groups of) actors. In the context of CASI-F, 'common' indicates that the framework for the assessment and management of SI could be used by the quadruple helix of SI stakeholders in multiple contexts.

## Framework

This refers to both the physical or virtual platforms (tools) around which something is developed, and the system of ontologies, methods and procedures (protocols) to inform and support decision-making.

## SI Action Roadmap

This refers to the generation of a portfolio of sub-actions supporting the transition management related to the implementation of a given 'SI Management Action' (see below).

## SI Assessment

This involves two complementary analyses: on the one hand, the identification, analysis and prioritisation of 'SI critical issues' (see below) associated with sustainability-oriented aspirations, policies and innovations and, on the other hand, the generation, analysis and prioritisation of 'SI actions' addressing prioritised critical issues.

## SI Critical Factor

This refers to the 50 factors (clustered around 10 SI Management Key Aspects) influencing the sustainability of innovations.

## SI Critical Issue

This refers to technological, economic, environmental, political, social, ethical and spatial (TEEPSES) issues shaping the present and/or future of a given sustainable innovation.

### SI Critical Issue Type 1: Barrier

This refers to any kind of existing limitation or obstacle – whether technological, economic, environmental, political, social, ethical or spatial – of a given sustainable innovation initiative.

### SI Critical Issue Type 2: Driver

This refers to any kind of existing force, trend or enabler – whether technological, economic, environmental, political, social, ethical or spatial – that fosters a given sustainable innovation initiative.

### SI Critical Issue Type 3: Opportunity

This refers to any kind of future possibility for a given sustainable innovation initiative to achieve something desirable, such as a technological, economic, environmental, political, social, ethical or spatial goal.

### SI Critical Issue Type 4: Threat

This refers to any kind of future possibility for a given sustainable innovation initiative to be affected by something undesirable, such as a technological, economic, environmental, political, social, ethical or spatial risk.

## SI Management

This refers to the process of generating multi-level and multi-stakeholder actions responding to multiple types of critical issues.

### SI Management Action:

This refers to any kind of managerial activity of a sustainable innovation at strategic, tactical or operational level.

### SI Management Action Type 1: Strategic level

This action involves 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.

### SI Management Action Type 2: Tactical level

This refers to actions from mid-level decision-makers aiming 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.

### SI Management Action Type 3: Operational level

This action requires 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.

## SI Management Dimension

This refers to any of the following four specific areas where managerial actions are almost certainly required for sustainable innovations: context, people, process and impact. A total of 50 critical factors were identified in these four dimensions.

### SI Management Dimension 1: Context

This dimension consists of 17 critical factors clustered around four key aspects: Momentum, reflecting the potential space for innovation, i.e. expectations of entrepreneurs and other actors, political drive from regulators or procurement, exemplars from other technological or social enterprises, and the perception of problems that call for solutions; Foresight, showing the capacity to anticipate, strategise and overcome gaps in the innovation curve; Resources, emphasising the need for healthy combinations of skills, finance, location, markets, etc; and Mobilisation, including champions and facilitators, civil society engagement, government engagement, research and education engagement, business engagement and proactive participation.

### SI Management Dimension 2: People

This dimension consists of eight critical factors clustered around two key aspects (i.e. aptitude and attitude) shaping the activities of the quadruple helix actors involved in sustainable innovation. Many objectives remain unfulfilled when innovations fail to connect or mobilise the right people, or do not provide the right incentives or skills for key people. 'Aptitude', refers to the actual skillset or competences of people involved in the design, development, implementation and diffusion of a sustainable innovation; 'attitude', means the type of behaviour of the same people.

### SI Management Dimension 3: Process

This dimension consists of 14 critical factors clustered around two key aspects: 'Catalysts', contributing to initiate, develop and implement the innovation; and 'Fosterers', including factors that further consolidate and diffuse the innovation.

### SI Management Dimension 4: Impact

This dimension consists of 11 critical factors clustered around two key aspects: 'Transformation', meaning the capacity to make positive changes in the quadruple helix of SI and knowledge production; and 'Sustainability', referring to changes in the socio-technical system where the SI operates that lead to positive environmental, social, economic, government and infrastructure transformations without compromising the needs and welfare of future generations.

## SI Management Key Aspects

This refers to 10 types of building blocs (momentum, foresight, resources, mobilisation, aptitude, attitude, catalysts, fosterers, transformations and sustainability) related to the four SI management dimensions (context, people, process and impact).

### SI Management Key Aspect 1: Momentum

This refers to the force that gets a sustainable innovation moving forward. There are three critical factors linked to this SI key aspect: political setting (including regulations, decisions, rules, policies, guidelines, etc); exemplars (including pioneering or leading models, standards, prototypes, examples, etc); and problems (including challenges, complications and difficulties as drivers of change).

### SI Management Key Aspect 2: Foresight

This refers to the future-oriented strategic driver of a sustainable innovation. There are three critical factors linked to this SI key aspect: horizon scanning-based approach (proactive mapping of critical issues, e.g. barriers, drivers, opportunities and threats); trends-based approach (reacting to current developments); and strategic targets approach (aligning goals with STI priorities of the system).

### SI Management Key Aspect 3: Resources

This refers to the means that can be drawn on by a sustainable innovation in its design, development, implementation and diffusion. There are five critical factors linked to this SI key aspect: geographical setting (both environmental and demographic conditions); funding (internal and external); infrastructure (physical and virtual); data (including hard and soft, e.g. statistics and insights); and scalability (potential to grow).

### SI Management Key Aspect 4: Mobilisation

This refers to the capacity of a sustainable innovation to reach and involve key stakeholders. There are six critical factors linked to this SI key aspect: champions and facilitators (to engage stakeholders); civil society engagement (to promote democracy); government engagement (to ensure governance and regulation); research and education engagement (to promote evidence-based decision-making); business engagement (to promote public-private partnerships to address market issues); and proactive participation (to address the needs of the quadruple helix SI players).

### SI Management Key Aspect 5: Aptitude

This refers to the actual skillset or competences of people involved in the design, development, implementation and diffusion of a sustainable innovation. There are four critical factors linked to this SI key aspect: leadership (to guide the innovation team); charisma (to inspire and mobilise key people); creativity (to reach original and innovative solutions); and knowledge (to make sound and informed decisions).

### SI Management Key Aspect 6: Attitude

This refers to the type of behaviour of people responsible for the design, development, implementation and diffusion of a sustainable innovation. There are four critical factors linked to this SI key aspect: enthusiasm (to spread interest and excitement); empathy (to be more responsive to the needs of potential SI users and beneficiaries); involvement (to promote cooperation and networking); and commitment (to achieve shared ownership and co-create success).

### SI Management Key Aspect 7: Catalysts

This refers to critical factors enabling the design and development phases of a SI process. There are seven critical factors linked to this SI key aspect: comprehensibility (to offer user-friendly solutions); crowd-sourcing (to achieve truly bottom-up financial support); learning-by-doing (to promote more assertive evolution and incremental innovation); supportive services (to deal with specific bottlenecks in the innovation process); absorptive capacity (to generate and act upon valuable information or intelligence); ex-ante impact evaluation (to recognise and measure important benefits and possible risks) and piloting and experimenting (to avoid disappointments and manage expectations).

### SI Management Key Aspect 8: Fosterers

This refers to critical factors supporting the implementation and diffusion phases of a sustainable innovation process. There are seven critical factors linked to this SI key aspect: incentives (to further position the innovation); coordination (to manage the relationship between the innovation team, sponsors, supporters and beneficiaries); networking and synergy (to better capitalise momentum-related critical factors); knowledge management (to reinforce the innovation capacity of the team); intellectual property management (to improve the competitive advantage of the innovation); ex-post impact evaluation (to promote improvements through learning and demonstrate the positive environmental, social and economic impacts of an innovation); and communication and dissemination (to increase the sectoral and geographical transferability).

### SI Management Key Aspect 9: (multi-agent) Transformation

This refers to positive changes in the quadruple helix of SI and knowledge production. There are six critical factors linked to this SI key aspect: stakeholder and community development (to consolidate new/existing players and promote spin-offs and networking); knowledge-based products and services (to increase academic, cultural or scientific advances); values and lifestyle changes (to promote knowledge- and media-based cultural and behavioural change); multi-challenge approaches (to better manage the complexity of dynamically changing socio-technical systems, visions and paradigms); capacities and skills (to support workforce development, competences and jobs); and entrepreneurship (to innovate and create new business opportunities).

### SI Management Key Aspect 10: (systemic) Sustainability

This refers to changes in the socio-technical system in which the SI operates that lead to positive economic, societal, infrastructure, environmental and government transformations. There are five critical factors linked to this SI key aspect: societal system sustainability (to improve social cohesion/interaction, community sense, education); economic system sustainability (to improve consumption, production, labour conditions, trade); environmental system sustainability (to protect cultural and ecological heritage, species, resources, environmental protection laws and policies, etc.); government system sustainability (to improve public participation and democracy) and infrastructure system sustainability (to improve the energy, water and food supply system, waste management, settlements and cities, transportation, distribution and knowledge-transfer channels).

## SI Management Dimension

This refers to any of the following four specific areas where managerial actions are almost certainly required for sustainable innovations: context, people, process and impact. A total of 50 critical factors were identified in these four dimensions.

## SI Mapping

This refers to the systematic process of nominating and assessing sustainable innovations in terms of their practices, outcomes and players.

## SI Mobilisation

This refers to the process of seeking the engagement and commitment of the quadruple helix of stakeholders in the systematic process of scoping, anticipating, recommending or transforming sustainability-oriented transition and futures.

## SI Mutual Learning

This refers to the participatory multi-stakeholder process of mapping, assessing and/or managing sustainability-oriented aspirations, policies and innovations.

## SI Public Participation or Public Engagement

This refers to the process of engaging the quadruple helix of SI stakeholders (i.e. government, business, civil society and research/education actors).

## Sustainable Innovation (short definition)

is 'any incremental or radical change in a socio-technical system leading to positive environmental, economic and social transformations without compromising the needs, welfare and wellbeing of current and future generations'.

## Sustainable Innovation (long definition)

is 'any incremental or radical change in the social, service, product, governance, organisational, system or marketing landscape that leads to positive environmental, economic and social transformation without compromising the needs, welfare and wellbeing of current and future generations'.

## SI Type 1: Product innovation

This refers to the introduction of a good that is new or significantly improved with respect to its characteristics or intended uses (OECD, 2005). Product innovations include: scientific advances with innovation potential, industrial innovations with deployment potential, and new products on the market with sustainability potential.

## SI Type 2: Service innovation

This refers to the introduction of a service that is new or significantly improved with respect to its characteristics or intended uses. For example, efficiency or speed improvements, new functions or characteristics of existing services, or the introduction of entirely new services (OECD, 2005).

## SI Type 3: Social innovation

This refers to new solutions (including products, services, models, markets, processes, etc.) that simultaneously meet a social need (more effectively than existing solutions) and lead to new or improved capabilities and relationships and better use of assets and resources. In other words, social innovations are both good for society and enhance society's capacity to act (Caulier-Grice et al., 2012).

### **SI Type 4: Organisational innovation**

This refers to the implementation of a new method in business practices, workplace organisation or external relations to increase performance by: reducing administrative costs or transaction costs, improving workplace satisfaction (and thus labour productivity), gaining access to non-tradable assets (e.g. non-codified external knowledge) or reducing costs of supplies (OECD, 2005). This includes business model innovations such as: new business/financial/infrastructure models, e.g. car/bike sharing or crowd-funded solutions.

### **SI Type 5: Governance innovation**

This refers to new forms of citizen engagement, new democratic institutions, new public and user participation in service design and delivery, and the use of public boards to govern particular choices. It includes new political arrangements in local and national governments as well as changes in the organisational form and arrangements for the planning and delivery of public services (Hartley, 2005). Governance innovations may also include: local policy innovation, i.e. policy transfer from other places, or public service reform.

### **SI Type 6: System innovation**

This refers to a set of interconnected innovations, where each is dependent on the other, with innovation both in the parts of the system and in the ways that they interact (Caulier-Grice et al., 2012). This normally involves a complex interaction of public policy and reforms to legislation, changes to business cultures and practices, as well as shifts in consumer attitudes and behaviour. System innovations also include combinations of two or more types of innovations but such cases are not always labelled 'systems'.

### **SI Type 7: Marketing innovation**

This refers to the implementation of a new marketing method involving significant changes in product or service design or packaging, placement, promotion or pricing (OECD, 2005). Sustainable marketing innovations are aimed at better positioning the social, economic and environmental benefits of new/improved products, services and processes.

# 10. References

Anttila, V. (2016) Report on CASI-F implementation. CASI project report. Deliverable 6.1.

CASI DoW (2015) Annex I to the Grant Agreement 612113 (Description of Work) of the CASI project on 'Public Participation in Developing a Common Framework for Assessment and Management of Sustainable Innovation', Theme SiS.2013.1.2-1 Mobilisation and Mutual Learning (MML) Action Plans: Mainstreaming Science in Society actions in research, European Commission.

CASIPEDIA (2017). State-of-the-Art of Sustainable Innovation Database. [Online]. CASI Work Package led by The University of Manchester, CASI project. Available at <http://www.casi2020.eu/casipedia/>.

Caulier-Grice, J. Davies, A. Patrick, R. and Norman, W. (2012) Defining Social Innovation. A deliverable of the project: 'The theoretical, empirical and policy foundations for building social innovation in Europe (TEPSIE)'. European Commission 7th Framework Programme. Brussels: European Commission.

Carayannis, E.G. and Campbell, D.F.J. (2009) 'Mode 3' and 'quadruple helix': toward a 21st century fractal innovation ecosystem. *International Journal of Technology Management* 46 (3–4), pp. 201–234.

Carayannis, E.G. and Campbell, D.F.J. (2010) Triple helix, quadruple helix and quintuple helix and how do knowledge, innovation and the environment relate to each other? A Proposed framework for a trans-disciplinary analysis of sustainable development and social ecology. *International Journal of Social Ecology and Sustainable Development* 1 (1), pp. 41–69.

Council of the European Union (2013). 'Council decision establishing the specific programme implementing Horizon 2020 - the Framework Programme for Research and Innovation (2014-2020) and repealing Decisions 2006/971/EC, 2006/972/EC, 2006/973/EC, 2006/974/EC and 2006/975/EC (15401/13)'.

European Commission (2001) 'European Governance: a White Paper'. COM(2001) 428, 25.7.2001.

European Commission (2009) 'Impact Assessment Guidelines'. SEC(2009) 92, 15.1.2009.

Gasparatos, A., El-Haram, M. and Horner, M. (2008) 'A critical review of reductionist approaches for assessing the progress towards sustainability'. *Environmental Impact Assessment Review* 28, pp. 286–311

Hacking, T. and Guthrie, P. (2008) A framework for clarifying the meaning of triple bottom-line, integrated and sustainability assessment. *Environmental Impact Assessment Review* 28 (2–3), pp. 73–89

Hansen, E.G., Grosse-Dunker, F. and Reichwald, R. (2009) 'Sustainability Innovation Cube – a framework to evaluate sustainability-oriented innovations'. *International Journal of Innovation Management*. 13 (4), pp. 683–713

Hartley, J. (2005) 'Innovation in Governance and Public Services: Past and Present'. *Public Money & Management* 25 (1) pp. 27–34.

Hölsgens, R., Schultze, J., Anttila, V., Kozarev, V. and Linford, S., Martin, L., Velasco, G., Popper, R. (2017) 'Lessons from a multi-level/stakeholder approach to sustainable innovation actions analysis', in Popper, R. and Velasco, G. (Eds.) *Sustainable Innovation Policy Advice*. CASI project report. Deliverable 7.2.

Ivanov, K., Damianova, Z., Asenova, D. and Kozarev, V. (2016) Mutual Learning Seminars – aggregated report. CASI project report. Deliverable 3.2.

López, A., Mabe, L., Sanchez, B., Tapia, C. and Alonso, A. (2015) Best practice solutions: methods for sustainability assessment within the process industries. SAMT project report. Deliverable 2.1.

Martin, L. and Avarello, A. (2016) Report on the pilot application of CASI-F for assessing sustainable technology innovation. CASI project report. Deliverable 5.1.

Ness, E., Piirsalu, U., Anderberg, S. and Olsson, L. (2007) 'Categorising tools for sustainability assessment'. *Ecological Economics* 60 pp. 498–508

OECD (2005) Guidelines for Collecting and Interpreting Innovation Data. Oslo Manual 3rd Edition. Paris: Organisation for Economic Co-operation and Development.

- Pihkola, H., Pajula, T., Tapia, C., Ritthoff, M. and Saurat, R. (2016a) Sustainability assessment methods and tools for cross-sectorial assessment. SAMT project report. Deliverable 3.1.
- Pihkola, H., Pajula, T. and Tapia, C. (2016b) Future research needs and input for standardization. SAMT project report. Deliverable 3.2.
- Pope, J., Annandale, D. and Morrison-Saunders, A. (2004) 'Conceptualising sustainability assessment'. *Impact Assessment Project Appraisal* 23 (4), pp. 293–302
- Popper, R. (2008) 'Foresight Methodology', in Georghiou, L., Cassingena H., J., Keenan, M., Miles, I., Popper, R. (Eds.) *The Handbook of Technology Foresight: Concepts and Practice*. Cheltenham: Edward Elgar.
- Popper, R., Velasco, G., Bleda, M., Amanatidou, E., Ravetz, J., Damianova, Z., Kozarev, V., Chonkova B., Tsin, S., Avarello, A., Martin, L. and Morris, D. (2016) 'Sustainable Innovation Conceptual Framework'. CASI Project report. Deliverable 2.2.
- Popper, R., Velasco, G. and Ravetz, J. (2016) State-of-the-art of Sustainable Innovation: Climate action, environment, resource efficiency and raw materials. CASI Project report. Deliverable 2.1.
- Popper, R., Velasco, G., Ravetz, J., Amanatidou, E., Schwarz-Woelzl, M., Damianova, Z. and Kozarev, V. (2016) Draft proposal of common framework for assessment and management of sustainable innovation (CASI-F). CASI Project report. Deliverable 4.2.
- Popper, R. and Velasco, G. (Eds) (2017) Sustainable Innovation Policy Advice. CASI project report. Deliverable 7.2.
- Popper, M., Tregner-Mlinaric, A., Popper, R., Velasco, G., Schwarz-Woelzl, M., Van Eynde, S., Ramioul, M., Damianova, Z., Kozarev, V., Martini, M., Hölsgens R. and Schultze, J. (2017) 'Sustainable innovation policy advice using a quadruple helix approach to 'innovations' mapping', in Popper, R. and Velasco, G. (Eds.) *Sustainable Innovation Policy Advice*. CASI project report. Deliverable 7.2.
- Saurat, M., Ritthoff, M. and Smith, L. (2015) Overview of existing sustainability assessment methods and tools, and of relevant standards. SAMT project report. Deliverable 1.1.
- Schultze, J., Schröder, A. and Hölsgens, R. (2016) Report on the pilot application of CASI-F for assessing sustainable social innovation. CASI project report. Deliverable 5.2.
- Schwarz-Woelzl, M., Haider, W. and Philipp, S. (2016) Stakeholder Workshop Report. CASI project report. Deliverable 4.3.
- Singh, R.K., Murty, H.R., Gupta, S.K. and Dikshit, A.K. (2009) 'An overview of sustainability assessment methodologies'. *Ecological Indicators* 9 (2), pp. 189–212.

# CASI

## Annexes

## 11.1. Annexe 1: CASI project work packages and tasks structure

The work plan spanned a period of 42 months (3.5 years) and was structured into 11 work packages.

**WP1: Management.** This work package established the management structure and internal management procedures. A Steering Committee was established as an oversight mechanism for the project, and an Advisory Committee and Network of country correspondents was set up to expand the geographical outreach of the project.

- Task 1.1. Technical management
- Task 1.2. Financial management
- Task 1.3. Management procedures
- Task 1.4. Action Networks
- Task 1.5. Sustainability of the project

**WP2: State-of-the-art.** WP2 laid the foundation for the rest of the project. It involved a state-of-the-art report on research and innovation related to the Grand Challenge 'Climate action, resource efficiency and raw materials' (SC5). Review, analysis and mapping of sustainable innovation initiatives were carried out to establish a conceptual theoretical framework, complemented by empirical cases gathered across Europe, and to provide a section on working definitions and approaches to sustainable innovations. This WP is closely linked to WP3, WP4, WP5 and WP6.

- Task 2.1. To systematically identify and review key sustainable innovation (SI) case studies
- Task 2.2. To map key practices in SI case studies
- Task 2.3. To map key players in SI case studies
- Task 2.4. To map key outcomes in SI case studies
- Task 2.5. To develop robust SI conceptual and methodological frameworks

**WP3: Dialogue and Participation.** WP3 ran in parallel with WP2 and went beyond it, aiming to build a common understanding of sustainable technological and social innovation, as well as a common approach to SC5 among the CASI partners and country correspondents. It enhanced the dialogue among consortium partners, country correspondents and relevant stakeholders across Europe on sustainable innovation and environment-related issues through the involvement of citizens in research and innovation policy-making, and by identifying topics for future research.

- Task 3.1. Capacity-building for the consortium partners and the country correspondents
- Task 3.2. Stakeholder Mutual Learning Seminars (MLS)
- Task 3.3. Webinar for wider societal learning and participation
- Task 3.4. Citizens and experts meetings

**WP4: Common Framework for Assessment and Management of Sustainable Innovations (CASI-F).** The objective here was to develop a common framework for assessing the sustainability of innovations, i.e. their advantages, disadvantages, relevance, benefits and risks, particularly their social, environmental and economic dimensions, taking into account general public concerns. For this purpose, an online survey was launched, and CASI-F held consultations with relevant stakeholders in the 12 participating countries.

- Task 4.1. Online survey on the characteristics of SI
- Task 4.2. Draft proposal of CASI-F
- Task 4.3. Stakeholders workshops on the draft proposal of CASI-F

**WP5: Pilot projects on testing and validating CASI-F.** In order to avoid collecting irrelevant and useless data, the CASI partners conducted a pilot testing of CASI-F. CASI-F was applied to a number of technological and social innovation cases gathered in WP2, so as to (i) identify shortfalls and (ii) propose adjustments/corrective changes to the assessment methodology.

- Task 5.1. Technology innovation cases to be assessed via the CASI-F
- Task 5.2. Social innovation cases to be assessed via the CASI-F

**WP6: Management of sustainable innovation.** WP6 ran in parallel with WP5. The partners worked with the case study actors involved in WP5 (technology or social innovators) in order to verify and include the changes requested or suggested in the final version of CASI-F.

- Task 6.1. Interviews/working meetings with the developers of innovation cases
- Task 6.2. Revision and finalisation of CFAMSI

**WP7: Policy Watch.** This WP has established a common interface for easy monitoring of EU and national policy cycles in order to enable the streamlining of sustainable innovation measures into organisational, national and European strategic and policy planning processes. Throughout this WP, partners have been engaged in producing policy briefs. The immediate output of this WP has served as input for the elaboration and advancement of policy recommendations within WP8. A natural outcome is the European Network on Sustainable Innovation Policy Watch.

- Task 7.1. EU-level policy debates monitoring
- Task 7.2. National policy debates monitoring
- Task 7.3. Reports on policy developments and initiatives
- Task 7.4. Online policy blog

**WP8: Policy Recommendations.** Activities were focused on developing specific policy recommendations for stimulating wider societal engagement in sustainable innovation activities, for their assessment and improved public management, targeting different levels of governance.

- Task 8.1. Policy dialogues among relevant stakeholders on a national level
- Task 8.2. European-level policy conference on identifying common European priorities
- Task 8.3. Final report on national and European-level policy recommendations

**WP9: Heritage.** The main challenge was to ensure that stakeholders in Europe, both within and without the consortium would benefit from CASI's outcomes. Several approaches were employed so that the overall sustainability would be ensured beyond CASI's formal duration.

- Task 9.1. Online training for the application of CASI-F
- Task 9.2. Promotion of CASI results and SI
- Task 9.3. Strategy to ensure the sustainability of the project and its results

**WP10: Communication and dissemination.** All communication and dissemination approaches to be applied during the project were listed in a communication strategy aiming both to raise awareness among all groups of stakeholders as to why it is necessary for them to interact, exchange ideas and participate in the process of sustainable innovations assessment, and to reach all targeted audiences.

- Task 10.1. Project web portal, homepage widgets, main modules and CMS access
- Task 10.2. CASI Knowledge platform – Online platform for internal exchange of knowledge
- Task 10.3. CASI Library – dissemination database
- Task 10.4. CASI Community – with social networking interfaces
- Task 10.5. CASI Communication Strategy
- Task 10.6. CASI Tutorials – Joint activities and education materials
- Task 10.7. Final national promotional events
- Task 10.8. Participation in EU-level events

**WP11: Evaluation.** This WP responded to the requirement of the call to establish systems for internal and external evaluation to ensure that project progress and results were in accordance with the work plan and met the objectives of the Science in Society programme.

- Task 11.1. External evaluation, made by independent experts
- Task 11.2. Internal observer
- Task 11.3. Internal evaluation by consortium partners

## 11.2. Annexe 2: CASI-F driven R&I policy agendas for SI

The following ten research and innovation (R&I) policy agendas for sustainable innovation (SI) are based on the CASI report 'State-of-the-art of Sustainable Innovation: Climate action, environment, resource efficiency and raw materials' (Popper et al., 2016b). These are further discussed in a CASI policy report chapter on 'Sustainable innovation policy advice using a quadruple helix approach to 'innovations' mapping' (Popper et al., 2017)

### SI Agenda 1: Strengthening eco-community empathy and crowd-funded development

The agenda for 'eco-community empathy', or the wider notion of 'sustainable communities', needs to balance aspirations with reality in a fragmented and often unequal world. At its roots, the notion of empathy is about inter-dependency and the building of reciprocity, solidarity and mutual aid. All this cuts across conventional boundaries around 'economy' or 'society'; likewise the responses to this Agenda include all seven types of SI.

There is an economic dimension to SI types that engage stakeholders in sustainable and crowd-funded businesses, building local and regional economic prosperity and resilience, and cooperative business models which can re-invest in local communities and endogenous regional development. A governance dimension seeks new models of multi-stakeholder engagement in long-term sustainable development actions; multi-sector public services which can address inter-connected problems; and new models for citizen empowerment and gender/ethnic equality.

An ecological dimension seeks policies, programmes, partnerships and networks to protect natural resources in urban and rural areas, in which ICT innovation can help to mobilise social innovation, and vice versa. Each of these feeds into a social, cultural and psychological agenda, where 'empathy' is a driver of behavioural change and of the building of more sustainable institutions.

#### Related H2020 priorities

- Resource efficient sustainable lifestyles
- Climate change mitigation solutions
- Climate action by sustainable lifestyle
- Eco-innovation and green economy transition
- Strategic intelligence and citizens' participation

#### Related citizens' priorities

- Supporting local/regional agricultural production, distribution and consumption systems
- Supporting people to become producers of renewable energy
- New working models – new economic models
- Fair and participatory access to limited resources
- Ensuring inclusive and dynamic city centres
- Sustainable living environments
- Sustainable economics
- Unified ecological grading system
- Research on business models and changing institutions related to a sustainable energy economy
- Supporting an active civil society for sustainable development
- Supporting 'Eco-preneurship'
- Access to natural resources as a human right
- Research on individual urban farming
- Co-developing green technology
- Impact of virtual communities in behavioural change

## SI Agenda 2: Developing sustainable urban and rural infrastructures for the bioeconomy

A sustainable economy means many things to many people, but a good place to start is with its infrastructures. Buildings and the built environment have huge potential for greening and material efficiency; the logistics and distribution systems of a complex economy can be tuned and restructured. Industrial supply chains can be managed through concepts of the 'service' and 'sharing' economy and consumption patterns can be reshaped in the light of new urban and rural infrastructure, promoting a circular bioeconomy.

However, all this goes far beyond technical issues, into the deeper waters of policy, behaviours, institutions, cultures, and so on. The SI types from CASI cover many angles of this; some are specific product solutions to specific problems, such as the technology of a green roof, but many more address the system-level inter-connections, with services, organisational, governance, social and system SI types.

Future R&I agendas should explore this further and more systematically, and look at how SI and sustainability R&I can develop new social-economy, connected-economy or foundational economy models which then enable the technology and product innovations to reach their potential.

### Related H2020 priorities

- Resource-efficient sustainable lifestyles
- Climate change mitigation solutions
- Climate action by sustainable lifestyle
- Eco-innovation and green economy transition
- Climate action eco-innovation policies

### Related citizens' priorities

- Supporting local/regional agricultural production, distribution and consumption systems
- Supporting people to become producers of renewable energy
- Sustainable construction of buildings
- New working models – new economic models
- Greater greening of cities
- Understanding and implementing sustainable electronics
- Sustainable living environments
- Sustainable economics
- Research on business models and changing institutions related to a sustainable energy economy
- Supporting Eco-preneurship
- Collaboration through shared space
- Co-developing green technology
- Impact of virtual communities in behavioural change

### SI Agenda 3: Deploying responsible environmental and resource-efficiency strategies

The environmental management agenda often raises conflicts between health and economic activity, between different social groups, or between costs and benefits. Often neither public policy nor markets are well suited to the scale of the problems, so the possible responses are found in many types of SI. For example, governance innovations look at new regulations, trading schemes, charging schemes and public information systems, as partial solutions. Product innovations focus more on the upstream issues of emissions control and monitoring, while many service innovations address whole systems such as transport or industrial supply chains, and the hotspots of residential areas and cultural assets. Water is likewise a cross-cutting issue, calling for new models of economic and social and informational exchange and inter-dependency.

Meanwhile, addressing the fundamentals of an urbanised society with widespread air and noise problems calls for systemic solutions for sustainable consumption, low-impact living, and education for behavioural change. Similar approaches apply to water resource management, where system-level concepts such as 'integrated catchment management' raise the challenge of inter-dependency and collaboration in a multi-level and multi-sector governance situation.

#### Related H2020 priorities

- Resource-efficient sustainable lifestyles
- Climate change mitigation solutions
- Climate action by sustainable lifestyle
- Eco-innovation and green economy transition
- Raw materials-conscious sustainable lifestyle
- Climate change adaptation solutions
- Solutions to water imbalances
- Solutions for cultural heritage assets
- Biodiversity monitoring and understanding
- Awareness of raw materials shortage
- Long-term raw materials availability

#### Related citizens' priorities

- Fair and participatory access to limited resources
- Sustainable living environment
- Unified ecological grading system
- Access to natural resources as a human right

## SI Agenda 4: Creating sustainable bio-fuel and renewable energy solutions

Energy is the basis of a complex industrial society, and the SI agenda works equally on the supply, distribution and demand sides. Many of the SI types from CASI look at specific technologies, such as biogas or anaerobic digestion. Many more look at the potential for social economic and governance models, such as community energy or eco-schools, which enable and encourage renewable energies on the supply side, or rapid efficiency improvements on the demand side.

As for future R&I agendas, there is the potential on the horizon for energy system transformation, in the sense of zero carbon supplies. More complex is the notion of energy cascades, both in technical terms such as industrial ecology, and in design or behavioural terms in the usage of buildings, appliances and mobility.

### Related H2020 priorities

- Resource-efficient sustainable lifestyles
- Climate change mitigation solutions
- Eco-innovation and green economy transition
- Eco-solutions to reduce raw materials use
- Solutions to explore, extract, process and recycle
- Alternative raw materials
- Awareness of raw materials shortage
- Effective raw materials policies
- Long-term raw materials availability

### Related citizens' priorities

- Supporting people to become producers of renewable energy
- Enhanced physical activity for better quality of life and energy efficiency
- Improvement of European electricity transmission to increase renewable energy production
- Sustainable living environments
- Research on business models and changing institutions related to a sustainable energy economy

## SI Agenda 5: Promoting foresight for sustainability governance and intelligence

The institutions of governance were developed for a 20th century model of industrial society. Today the 21st century agenda for sustainability in a highly inter-connected world calls not only for marginal improvement but for new models of governance. Some of the SI priorities from CASI call for citizen engagement or new levels of policy integration, while some focus on the resources in the public sector at a time of shrinkage. The potential of ICT and 'datafication' is huge in all these.

For the future, new models of governance need to be explored more systematically, and applied in every sector where governance has a role. The SI cases in CASI so far are a good demonstration of the current state of the art. Some of them, though experimental, point towards alternative models and institutions for decision-making, representation and participation, active engagement of all sectors, sustainable resource management, and public services which can 'do more with less'.

### Related H2020 priorities

- Climate change mitigation solutions
- ICT systems improving resource efficiency
- Strategic intelligence and citizens' participation
- Climate change adaptation solutions
- Climate action eco-innovation policies
- Solutions for cultural heritage assets
- Biodiversity monitoring and understanding
- Effective raw materials policies
- ICT to assess and predict climate actions
- Climate change projections and scenarios
- ICT mapping natural resources and trends
- ICT systems to map raw materials trends

### Related citizens' priorities

- Fair and participatory access to limited resources
- Sustainable living environments
- Unified ecological grading system
- New spaces for public discourse

## SI Agenda 6: Advancing recycling and circular use of waste and raw materials

In the aspiration to a circular economy, waste is simply a resource in the wrong place but, in current realities, the pressures on large and small businesses and organisations seem to produce waste, which then has to be managed. Some waste streams are more viable than others for re-use, re-engineering or recycling. The CASI cases show a wide range of approaches, from the small scale of social enterprises, which train the unemployed in repair skills, to the large scale of national schemes for industrial symbiosis. They cover the full range not just of product innovations but also of social, service, governance, organisational, marketing and system innovations.

For the outlook, while the principles of a circular zero-waste economy are accepted on all sides, the practice depends on many challenges still to be addressed. The R&I effort should focus systematically on issues such as circular business and finance models, circular consumption systems in households and communities, and the implications of the sharing/experience economy and of globalised business and lifestyles.

### Related H2020 priorities

- Resource-efficient sustainable lifestyles
- Climate change mitigation solutions
- Climate action by sustainable lifestyle
- Eco-innovation and green economy transition
- Eco-solutions to reduce raw materials use
- Raw materials-conscious sustainable lifestyle
- Solutions to explore, extract, process and recycle
- Alternative raw materials

### Related citizens' priorities

- Sustainable construction of buildings
- Sustainable living environment
- Collaboration through shared space

## SI Agenda 7: Embedding sustainability in cultural and holistic education models

Clearly a sustainable future is in the hands of the young and the education system which surrounds the theme, but it is also in the hands of citizens, workers and policy-makers at all levels, whose skill-base and knowledge-base can shape the world as it is. In this light, and defying the conventional trappings of a modern consumerist, high-mobility, high-impact society, the CASI evidence-base is particularly relevant in terms of the Citizens' Panels, which seem to provide the foundations of an alternative and more sustainable model. This plays out in the SI cases, where not only school curriculum design but alternative notions of 'what is a school' are explored.

For the agenda in prospect, there are many trends and pressures, such as on-line education and gamification, the use of big data or social media in eco-feedback for citizens and businesses, pressure on education for 'results' and 'impacts' and, generally, countering the culture of globalised consumerism and distrust of governance. The CASI cases demonstrate some ways into this, but the next R&I programmes should systematically explore the potential and also the barriers to education for sustainability.

### Related H2020 priorities

- Resource-efficient sustainable lifestyles
- Climate change mitigation solutions
- Climate action by sustainable lifestyle
- Strategic intelligence and citizens' participation
- Climate change adaptation solutions
- Awareness of raw materials shortage

### Related citizens' priorities

- Holistic education for a sustainable future
- Enhanced physical activity for better quality of life and energy efficiency
- Sustainable living environment
- Impact of virtual communities in behaviour change

## SI Agenda 8: Fostering eco-local-agriculture and bio-resources efficiency

Food and farming systems underpin almost every sector and community. On the supply side, farming and fisheries are deeply embedded in rural and coastal economies and societies, as well as in environment and climate issues. On the distribution and demand side, food is a deeply cultural and psychological issue, at the same time raising huge challenges in public health and education. A wide range of CASI cases demonstrate this inter-connectedness (although with fewer product types than elsewhere). Many focus on the local community level and aim for more feedback and circularity between producers and consumers. Some look at industrial ecology and alternative cultivation, such as aeroponics or aquaculture.

Are there transformational innovations or systems in prospect, beyond the small-scale experiments and community social innovations? Some ideas come directly from citizens themselves, such as 'insect food' or 'edible towns'. Future R&I should explore the multi-scale questions more systematically, i.e. how to scale up the micro-innovations, and also how to influence global food systems for a post-oil sustainable food transition.

### Related H2020 priorities

- Resource-efficient sustainable lifestyles
- Climate change mitigation solutions
- Climate action by sustainable lifestyle
- Eco-innovation and green economy transition
- Biodiversity examination and understanding

### Related citizens' priorities

- Supporting local/regional agricultural production, distribution and consumption systems
- Innovating agriculture: the sustainability option
- A new European food culture
- Research on individual urban farming
- Exploring the introduction of insects as food

## SI Agenda 9: Implementing sustainable transport and smart mobility innovations

Sustainable a mobility, accessibility and/or transport modal shift is a well-worn path of R&I, in technology, behaviour and governance. The CASI cases demonstrate the state of the art: many new opportunities are coming through smart cities and the use of big data and mobile technology. Other opportunities on the demand side or modal shift are in social innovation and 'community empathy'. Vehicle technology continues to progress but in some cases meets a system-level barrier, as with deployment of electric or hydrogen-based vehicles. Urban design has made some progress towards pedestrian zones and accessibility planning, but there is much further to go.

The outlook raises challenges in several ways. One is that of technology determinism (as in smart cities systems), versus wider debates on 'the right to the city' (as in the reshaping of local communities, housing markets and local economies). Another is about the question of unlimited mobility as the foundation of a fluid, outsourced, globalised economy and society. Future R&I agendas should explore these tensions as an essential under-pinning to practical initiatives on transport supply and demand.

### Related H2020 priorities

- Resource-efficient sustainable lifestyles
- Climate change mitigation solutions
- Climate action by sustainable lifestyle
- Eco-innovation and green economy transition

### Related citizens' priorities

- Sustainable transformation of existing traffic infrastructure in cities
- New working models – new economic models
- Sustainable living environments

## SI Agenda 10: Dealing with climate issues and managing greenhouse gas emissions

As climate change is perhaps the ‘grandmother’ of all environmental problems, and despite the agreement on aspirations at the Paris COP, complete solutions are not expected in the near future. There are uncertainties on costs and benefits, controversies on resources and restructuring of economies and infrastructure, and a continuing campaign of scepticism and denial, not only from lobby groups but also as a result of disconnections in the public mind and psychology. The CASI cases demonstrate this wide range of issues and possibilities, from practical technologies or business models to national infrastructures. Many also focus on the human side of education, feedback, ‘community empathy’ and cultures of inter-dependency and responsibility, as well as on practical social-finance business models or land-use regimes.

Future R&I agendas could take such initiatives and many others as a starting point, i.e. where climate solutions are not only a technocratic top-down type of ‘problem’, but more about opportunities distributed across many sectors and many levels. If we can systematically explore these wider inter-connections between multi-level and multi-sectoral opportunities, there is a better chance of shifting climate change from ‘problem’ to ‘opportunity’, and engaging all parts of society in a common aim.

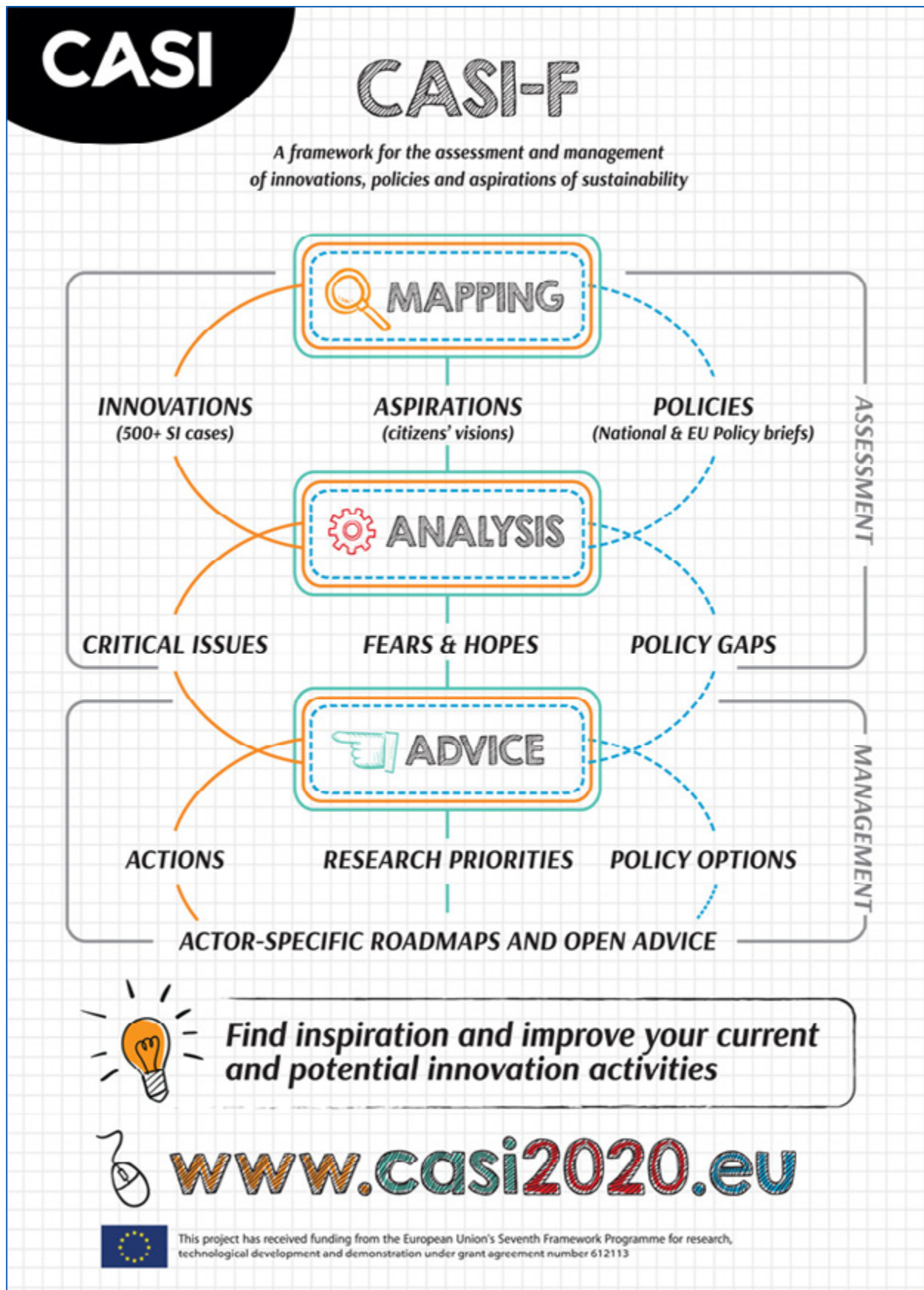
### Related H2020 priorities

- Climate change mitigation solutions
- Climate action by sustainable lifestyle
- Climate change adaptation solutions
- Climate action eco-innovation policies

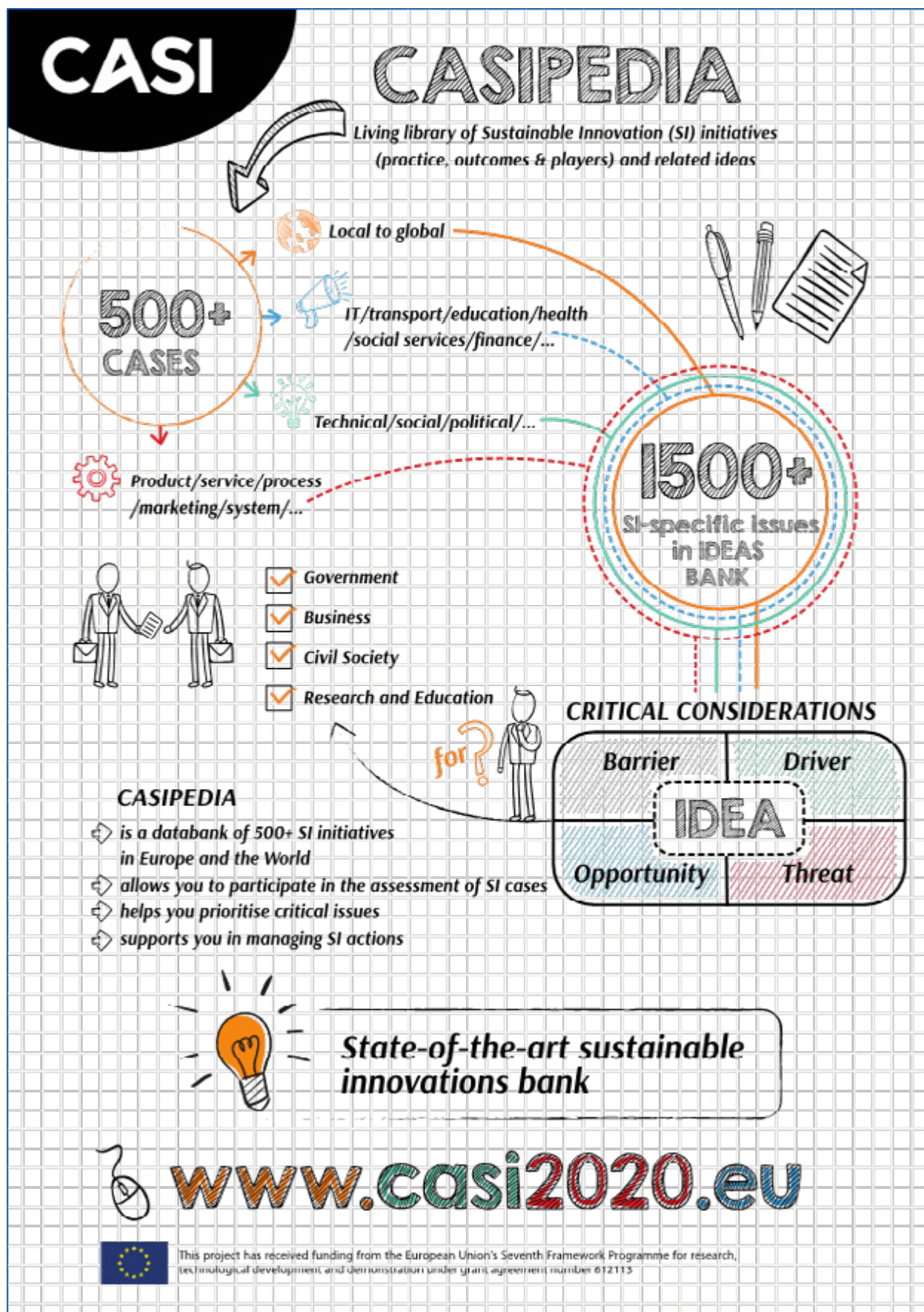
### Related citizens’ priorities

- Supporting local/regional agricultural production, distribution and consumption systems
- Sustainable economics

## 11.3. Annexe 3: Visualising CASI-F



## 11.4. Annexe 4: Visualising CASIPEDIA



## 11.5. Annexe 5: CASI-F benefits and impacts

### MML Interview on CASI-F benefits and impacts from a CASI partner's perspective

**Interview with Mattia Martini – Researcher at the University of Milano-Bicocca (UNIMIB)**

**By Monika Popper**

**You have recently engaged your students in a mapping activity that involves the elements of nomination, assessment and management of Sustainable Innovations facilitated by the CASI Framework (CASI-F protocols and tools). Can you tell us more about it?**

"In February 2017 I got involved in a new course on 'Management and Social Entrepreneurship' within the Master's degree programme in Management and Service Design at UNIMIB. It is a blended course, where traditional classroom lessons alternate with online sessions and project work to be carried out by students. As project work activity the students were assigned the application of CASI-F to a new sustainable innovation (SI) case. In small groups (max 3-4 students per group) the students were asked to:

- nominate a Sustainable Innovation case
- map the SI case (in terms of practices, outcomes and players)
- identify critical issues related to the case
- develop an Action Plan/Roadmap to support SI management

Each group has to complete the above steps using the CASI platform and involving one or more stakeholders from the case. The students were provided with supporting material, including CASI project reports (Deliverables 2.1, 2.2, and 6.2), CASI webinar sessions and PDF examples of four fully mapped SI cases from CASIPEDIA. The students will present their work to course lecturers and other students in a classroom session."

**How many new cases have been nominated by the students so far and upgraded to full mapping? Are more nominations expected?**

"As of today, 17 new SI cases have been nominated and accepted for full mapping based on the review of information and relevance assessment I conducted. The initiatives address different types of innovation; most involve product, service and social innovation. Since the activity is still ongoing, a few more cases may be nominated in the coming days but, as the total number of students is 45, I think we are about to reach the target."

**Would the students work independently or would the mapped cases be a result of wider engagement and co-creation?**

"Once the overall instructions about the content and structure of CASI-F and CASIPEDIA had been presented to students in two sessions (2hrs each), the students started on the group work. Students who entered the selected cases into the system were able to invite other students to co-create the case (i.e. all invitees have rights to contribute). The students were also asked to contact innovators, who could be invited to review and collaborate in the mapping process. The minimum engagement with the innovators required from the students is to conduct an interview with the innovator in order to complete the full mapping. Depending on the availability and interest of the innovators, they could be involved in a second meeting to jointly assess and prioritise SI-related critical issues and define an action plan for improved management of SI. It will be really interesting for us to know how many innovators became engaged in the process and which elements or stages of it were most useful for them (this information was available from the end of March 2017)."

### What is the students' overall attitude towards this Mobilisation and Mutual Learning initiative (i.e. bottom-up and crowd-sourced mapping of SI)? What is the level of their engagement and motivation?

"In the preliminary sessions, when the students were presented with the assignment description they were a bit afraid, as it appeared quite challenging to them. In particular, they were worried by the fact that the case and the action plan had to be mapped in CASIPEDIA using English.

However, from the beginning of the assignment I have seen them strongly motivated and soon afterwards they started nominating and mapping the cases. Most students had immediate ideas about initiatives they wanted to map, which related to a product or service they had heard about or come across and considered interesting. The students then started contacting the innovators and receiving positive responses regarding their availability and willingness to collaborate, which is very encouraging and will further motivate the students, in my opinion."

**Note:** Since 16 February 2017, 263 online activities (edits/updates) and 49 invites to cases were sent and recorded in the system. These are related to the 17 cases that are still being mapped by UNIMIB students and the numbers increase each day. Additional evidence of high-level of engagement among the students is provided by the fact that some of these activities took place during weekends and at unusual times.

### What is the added value of conducting such an exercise? For students, lecturers, innovators, and for sustainability/innovation-oriented courses in general?

"I am fully convinced that the mapping exercise applying CASI-F is very useful for students and lecturers. I will have a full picture of CASI-F's potential at the end of the exercise, but I can already confirm what follows.

In my opinion, the most positive and interesting things for the students are:

- The application of CASI-F to a real case is considered a good opportunity to learn by doing, in a way that is better and more interactive than the traditional and largely theoretical lessons.
- Practically applying CASI-F not only enhances the ability of students to analyse SI cases, it also forces students to critically analyse the case and to use reason when proposing possible solutions for SI development.
- The students feel they are doing something that could be useful not only for them, but also for the innovator (who may benefit from receiving feedback and proposals for the development of their innovation).
- They are proud to be 'involved', to contribute, and to do what researchers and professors from UNIMIB have done themselves, in an EC-funded research project (i.e. CASI).

For lecturers and the course in general:

- Lecturers can rely on a well-structured procedure for analysing SI initiatives, which does not need to be strongly modified to be used in the context of a Master's course.
- Plenty of comprehensive supporting material is already available for students to better understand the overall CASI-F procedure (students can then work autonomously on most of the steps). The upcoming CASI online training course will further reinforce this aspect.
- By contacting and interacting with innovators (potential employers), the students not only widen their network within the labour market but also promote the 'Management and Social Entrepreneurship' course, which may be of interest to start-ups, SMEs, and the like.
- In general, I have a positive feeling about the potential use of CASI-F in university courses. Particularly when it comes to the area of sustainability and innovation (still under-researched and ambiguous in nature), it is very useful to allow students to deepen the topic by working in the field (by directly interacting with innovators).
- With regard to innovators, we would be very interested in knowing whether they have found any added value in the collaboration with our students and look forward to receiving their feedback at the end of the project's work."

With regard to innovators, we would be very interested in knowing whether they have found any added value in the collaboration with our students and look forward to receiving their feedback at the end of the project's work."

### Would you consider the engagement of students as a useful strategy to support (content-wise) the sustainability of CASIPEDIA?

"Perhaps, but I believe that some peer review processes will be needed to ensure the quality of inputs."

## MML Interview on CASI-F benefits and impacts from a CASI country correspondent's perspective

### Interview with Edgaras Leichteris – CASI Country Correspondent for Lithuania

By Monika Popper

The final version of CASI-F (Popper et al., 2017) presents the common framework for the assessment and management of sustainable innovation as a five-step approach consisting of:

- Step 1: sustainability relevance and scanning (i.e. case nomination)
- Step 2: multi-criteria analysis and assessment (i.e. case mapping)
- Step 3: critical issue analysis and assessment (i.e. assessing critical issues)
- Step 4: multi-level advice management (i.e. developing multi-level actions)
- Step 5: action roadmaps management (i.e. developing multi-dimensional responses)

**In your opinion, can this qualitative five-step approach improve the assessment and management of sustainable innovations by complementing existing quantitative tools and methods (e.g. Life Cycle Assessment and derived sub-sets)? If so, how?**

"Definitely! To me it is a good example of the practical implementation of a multi-level governance approach, very well structured and implemented in a clear and consistent manner, giving a much broader perspective than Life Cycle Assessment and similar, which helps to better involve stakeholders."

**In your opinion, how did the CASI online mapping environment (CASIPEDIA) facilitate the assessment of the selected SI initiatives? Were the mapping forms useful in structuring, obtaining and bringing together different pieces of an SI 'jigsaw'? Did they capture its complexity and ambiguity, influenced by multiple criteria and the interaction of multiple stakeholders?**

"CASIPEDIA is a very important tool, which needs to be constantly updated in the future, in order not to lose momentum. Identified cases become obsolete with time, so this system needs to be a 'living system' constantly fed with new cases. Mapping forms could be simplified a little bit – they really have all the right angles for putting different pieces of an SI 'jigsaw' together, but the complexity is high. It may be difficult to sustain the quality of CASIPEDIA over time without investment and effort. Such investment will be necessary from time to time to improve quality, but at the same time important to ensure a continuous flow of new information into the database."

**Do you think the online mapping environment with interconnected modules – i.e. information mapped in CASIPEDIA being automatically extracted to feed the 'Ideas Bank' and the 'Actions and Roadmaps Bank' with critical issues, actions and sub-actions to improve the management of SI – is a useful tool to support R&I projects and activities?**

"Although I haven't explored these additional features of CASI-F much, I think it is a good idea to have such interconnected modules, but to me CASIPEDIA and the availability of 'raw' information about SI cases is a much more important tool."

**In your opinion, does the mapping environment effectively support mutual learning and the co-creation and co-exploitation of knowledge (e.g. through bottom-up and crowd-sourced mapping of SI)?**

"Definitely! I am constantly sharing the methodological framework created by the CASI project with our international partners. Most recently (February 2017), I presented CASI-F to the methodological leaders of the HoCare project <http://www.interregeurope.eu/hocare/>. They can now think about some potential cooperation and transferring the methodology to the healthcare innovation sector. Then in March, it was presented at the Interregional meeting of the SUPER project <http://www.interregeurope.eu/super/>, which deals with 'eco-innovations'. Participants were very interested in the CASI Framework and the database of cases. These two examples show that mutual learning has already started."

## MML Interview on CASI-F benefits and impacts from an innovator's perspective

### Interview with Antonios Lygidakis – Co-founder of ECOVERIFIED (SI case mapped/piloted by CASI)

By Monika Popper

An innovator's account of the five steps of CASI-F:

- Step 1: using CASI-F protocols and tools for sustainability relevance and scanning (case nomination)

**Your case was recognised and nominated as an example of sustainable innovation addressing the issue of sustainable tourism, offering a Certified Eco Label. Are you still pursuing the same objectives and are you aware of other initiatives addressing the same?**

"We are still working under the same environmental principles but our direction has changed. This happened because our competition is well established in the field, creating a monopoly. However, our team is equipped with technical knowledge and we are now aiding global green projects on sustainable energy and environmental protection. We are also advising funding bodies on the potential impact of their investments."

- Step 2: using CASI-F protocols and tools for multi-criteria analysis and assessment (case mapping)

**The nature of sustainable innovation is indeed very complex and not yet fully understood. There are many elements ('pieces of a jigsaw') that need to be considered for the innovation to become successful. Did the mapping exercise help you bring these pieces together so that you could identify gaps and areas of strength?**

"The mapping helped us identify potential problems that we previously thought were not important. We have used the mapping forms to codify strategic responses to barriers, weaknesses and threats, as well as strengths and opportunities identified during the interviews. We then used the mapping tool CASIPEDIA to further describe the most important critical issues. During our meetings with the CASI team from the University of Manchester, strategic ideas were also proposed in face to face discussions that we later implemented."

- Step 3: using protocols and tools for critical issue analysis and assessment (assessing barriers, threats, opportunities and drivers that can positively or negatively influence/impact the innovation)

**Using CASI-F, have you identified any important issues that you did not realise or think of before?**

"We got several ideas during the interview, as mentioned above, when brainstorming on potential critical issues and solutions. One of them was the incorporation of a mobile phone app that would create user incentives on environmental issues. On the whole, we want to thank the University of Manchester CASI team for the consulting and discussions they provided. They made us think in a more commercial way and better understand the needs of the market."

- Step 4: using protocols and tools for multi-level advice management (developing actions for different stakeholders at different levels)

**Did the actions support more effective implementation of your initiative? By, perhaps, thinking about the roles and interaction between different stakeholders at different levels?**

"As I mentioned previously, we are not functioning towards the same direction anymore. The discussion we had with the CASI team during our interviews made us realise some potential routes we should follow and threats we should take into consideration. From that day onward we tried to deal with problems more efficiently and identified some dead ends. Therefore, the shift in our direction happened sooner rather than later with a minimal impact because of the consulting we received. This mobilisation and mutual learning approach the CASI team followed with our team proved to be advantageous for our company's survival."

- Step 5: using protocols and tools for action roadmaps management (developing more detailed sub-actions for the selected action)

**Have you implemented the roadmap or at least some of the sub-actions from the roadmap?**

"We have implemented most of the roadmap's sub-actions. Some of them were not considered unique projects before CASI mapping. They were later treated exclusively with great success."

**CASI**

