



# STI Roadmaps for Sustainable Development Goals

Potential impact of Smart Specialisation  
on SDGs



 [JRC-B3-S3P@ec.europa.eu](mailto:JRC-B3-S3P@ec.europa.eu)  
 [s3platform.jrc.ec.europa.eu](http://s3platform.jrc.ec.europa.eu)  
 @S3Platform

Joint  
Research  
Centre



SUSTAINABLE  
DEVELOPMENT  
GOALS

The Joint Research Centre (JRC) supports the Sustainable Development Goals

## Relation between the identified challenges, potentials and knowledge gaps and the Smart Specialisation priority domains in Serbia

This analysis addresses the research question “How do the identified challenges, potentials and knowledge gaps relate to Smart Specialisation priority domains in Serbia?”

First, it must be acknowledged that any sector and any technology, through better practices, can have an important contribution to the Sustainable Development Goals. For instance, better labour practices in the priority areas can have positive impacts in goals 1, 3, 5, 8, 9 and 11. Better environmental practices can have positive impacts in goals 3, 6, 7, 11, 12, 13, 14, 15.

Beyond these general relationships, which can be true for any sector anywhere, the current analysis will have a narrower look at the identified challenges, potentials and knowledge gaps and the smart specialisation priority domains in Serbia, based on the STI analysis.

Generally, the complex nature of the SDG challenges will require formal support and quadruple-helix orchestration since market incentives may be insufficient to steer activities in the desired direction.

Two main directions of action can be identified to address the main challenges within SDGs, and/or to pursue opportunities in the framework of the SDGs from the S3 priority domains.

1. Pull capacities from the S3 priorities towards the main challenges in the context of the SDGs.
2. Steer and exploit the potential of innovation in the S3 priorities towards the SDGs, even if some of these are not priority challenges in Serbia.

In the first case, new investments, new policy measures, new international collaborations can be necessary to address the challenges. In the second case, market incentives (particularly at the international level) should be the main driver of new innovations and developments.

Transversally, beyond technological innovation and business development in the context of smart specialisation, SDG-oriented transformations must engage in responsible practices (anticipation, reflexivity, inclusion and responsiveness<sup>1</sup>), foster social innovation and be coupled with progressive public policies. This is especially true for higher-priority Goals 1, 4, 10, which, as shown below, only have an indirect innovative input from the Serbian S3 priorities.

### Serbia Smart Specialisation Strategy (4S) priority domains

---

<sup>1</sup> Stilgoe, J., Owen, R., & Macnaghten, P. (2013). *Developing a framework for responsible innovation. Res. Policy, 42*, pp. 1568-1580

- Information and communication technologies
  - Custom Software Development
  - Software Solutions Development
- Food for Future
  - High Tech Agriculture
  - Value Added Food products
  - Sustainable Agrifood Production
- Creative Industries
  - Creative audio-visual production
  - Video Games and Interactive content
  - Smart Packaging
- Future Machines and Manufacturing Systems
  - General and specific purpose machines
  - Information in the Smart Management Service - Industry 4.0
  - Smart Components and Tools
- Energy Efficient and Eco-Smart Solutions
- Key Enabling Technologies

The table below presents an analysis of the relationship between STI potential and gaps with the four vertical and two horizontal S3 priorities. It also provides a short risk assessment that can help establish principles in the STI roadmaps for the SDGs. It is based mainly on the nature and orientation of the Goal targets, and on the Finer-grained STI potential and knowledge/competence gap analysis.

Several of these opportunities were identified by representatives of the S3 working groups corresponding to the four S3 priorities during the Smart Specialisation for Sustainable Development Goals – pilot activity workshop in Serbia, Belgrade, February 27th 2020.

S3 priority	Potential impact in the main challenges in resulting from the SDGs in Serbia
<p><b>Information and communication technologies</b></p> <ul style="list-style-type: none"> <li>• Custom Software Development</li> <li>• Software Solutions Development</li> </ul>	<p><b>Potential and opportunities</b></p> <p>As a transversal priority domain, ICT can have a horizontal role in supporting technification<sup>2</sup> and innovation (Goal 9) and improving employment (Goal 8). During the participatory workshop in Belgrade, representatives of the Smart Specialisation ICT working group cited the following specific SDG-oriented opportunities:</p> <p>Supporting the capacity-building and development of the section of society which thus far are less digitised, addressing the digital divide. With adequate education, training and labour policies, ICT can produce important economic traction and employment opportunities addressing poverty (Goal 1) and inequality-inclusion (Goal 10) challenges, for minorities, population with disabilities and women (Goal 5).</p> <p>Supporting the digitalisation of the public administration, which has a key role in providing common goods and services essential for the achievement of the SDGs.</p> <p>Important ICT-related STI opportunities are open, and already being pursued by Serbian companies, in Education (Goal 4) notably through distant and digitally-enhanced learning (see the Finer-grained STI analysis for further detail).</p> <p>A large area of opportunity lays in Good Health and Well-being (Goal 3), through medical devices, e-health and digital health.</p> <p>Similarly, the middle-priority challenges Goal 7. Affordable and Clean Energy and 11. Sustainable Cities and Communities, which already present a strong STI ecosystem, offer large opportunities for ICT particularly in the domains of energy efficiency, smart grids, smart cities and sustainable and efficient transportation.</p> <p><b>Gaps</b></p> <p>As shown in the Finer-grained STI analysis, the discipline of Computer Science presents a lower specialisation index in SDG-oriented activities than in the EU27 and particularly EU13 countries. To address this gap, the ICT sector must grow in size and/or focus more attention on SDG-related topics. Nevertheless, this can have an impact on the sector's external competitiveness.</p> <p>Although many ICT-related projects can be identified in Horizon 2020 and the Innovation Fund programmes, very few of them are related to higher-priority challenges in Goals 1 and 10. From a policy point of view, further support for societal-challenge oriented and social innovation ICT activities could be advisable.</p> <p><b>Risks</b></p> <p>The main risks associated with ICT in the context of the SDGs are related to automation, potentially leading to unemployment in traditional and lower-added value sectors, low quality employment in some categories, income inequality and the digital divide. Adequate corporate, labour, and education policies are necessary to guarantee the positive directionality of ICT development in the context of the SDGs.</p>

<sup>2</sup> The action or fact of making technical; the adoption or imposition of technology or technical methods (Oxford University Press English Dictionary).

### Food for Future

- High Tech Agriculture
- Value Added Food products
- Sustainable Agrifood Production

### Potential and opportunities

This is a clear domain of connection between smart specialisation and the STI capacities and opportunities related to the SDGs.

Opportunities in Goal 2. Zero Hunger are present in innovations related to agricultural and food industry machinery, improved production processes and new food products, with contributions from mechanical engineering, chemistry and biotechnology.

During the participatory workshop in Belgrade, representatives of the Smart Specialisation Food for Future working group cited the following specific SDG-oriented opportunities identified during EDP.

Goal 2 targets 2.3, 2.4 and 2.5 as SDG-oriented development pathways for the sector. The following extractions summarize these pathway opportunities:

- "By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment"
- "By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality"
- "By 2020, maintain the genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species, including through soundly managed and diversified seed and plant banks at the national, regional and international levels, and promote access to and fair and equitable sharing of benefits arising from the utilization of genetic resources and associated traditional knowledge, as internationally agreed"

At the intersection of the Food for Future priority and Goal 2 Good Health and Well-being: safe, healthy and functional food are clear areas of opportunity. In that sense, "biomedicine" was incorporated into the priority during EDP.

Climate change (Goal 13.) is seen as a threat, and the sector understands it is not prepared technologically to address it.

Responsible consumption and production is also of interest, both as a transversal lever for sectoral improvement as well as to pursue specific market opportunities. In general, through better environmental practices and Sustainable Agrifood Production, this priority can help address challenges in middle-priority goals: 6. Clean Water and Sanitation and 7. Affordable and Clean Energy, as well as an indirect effect on lower lower-priority challenges goals 12. Responsible Consumption and Production, 13. Climate Action, 14. Life Below Water and 15. Life on Land.

Through rural development, Food for Future can have a positive impact in higher priority challenges Goal 1. No Poverty and 10. Reduced Inequalities.

Engineering and chemistry are the two disciplines where Serbia presents relative strength.

	<p><b>Gaps</b></p> <p>The first gap is that, although the Goal 2-related STI ecosystem is active and entrepreneurial, it lacks critical mass in the scientific domain (small specialisation index vs. EU13 countries) and impact: only 7% of Goal 2-related publications have been published in the TOP10% journals, below the average for the rest of goals (10.2%).</p> <p>Growth in the Goal 2-related scientific system and increased research collaboration with foreign partners may be necessary to exploit all the transformation opportunities.</p> <p>Specially, there is a gap in Goal 2-related scientific activities in Environmental Science and the Social Sciences, which, additionally, could improve the embeddedness and impact of the Food for Future STI activities in the territory.</p> <p><b>Risks</b></p> <p>The main risks associated to Food for Future in the context of the SDGs are related to automation and environmental impact, potentially leading to unemployment in traditional and lower-added value sectors, destruction of rural livings and income and territorial inequality. Adequate corporate, labour, environmental and cohesion policies are necessary to guarantee the positive directionality of these techno-industrial developments in the context of the SDGs.</p>
<p><b>Creative Industries</b></p> <ul style="list-style-type: none"> <li>● Creative audio-visual production</li> <li>● Video Games and Interactive content</li> <li>● Smart Packaging</li> </ul>	<p><b>Potential and opportunities</b></p> <p>The design and production of interactive content for educational and training purposes can have an important impact in higher priority Goal 4 Quality Education, particularly in the top targets:</p> <ul style="list-style-type: none"> <li>● By 2030, ensure equal access for all women and men to affordable and quality technical, vocational and tertiary education, including university</li> <li>● By 2030, substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship</li> </ul> <p>During the participatory workshop in Belgrade, representatives of the Smart Specialisation Creative industries working group cited the following specific SDG-oriented opportunities related to:</p> <ul style="list-style-type: none"> <li>● Measures for a reduction in the energy consumption in audio-visual productions, in alignment with Goal 7.</li> <li>● Measures for a reduction in the waste production in audio-visual productions (eg. <a href="#">Green filming</a>), in alignment with Goal 12.</li> <li>● Smart and green packaging, in alignment with Goal 12.</li> </ul> <p>There is wide-spread awareness in the sector of the huge waste production related to packaging. STI activities in smart packaging can bring value in the context of safe and quality food (Goals 2 and 3) as well as positive environmental impact in lower priority challenges goals 12. Responsible Consumption and Production, 13. Climate Action, 14. Life Below Water and 15. Life on Land. It was commented that adequate legislation could help align actors and accelerate transformations, particularly on the side of the consumer</p> <p>As with the ICT sector, the Creative industries can have a horizontal role in supporting innovation (Goal 9) and improving employment (Goal 8). With adequate training and labour policies, it can produce</p>

	<p>important economic traction and employment opportunities addressing inequality-inclusion (Goal 10) challenges, for minorities, population with disabilities and women (Goal 5).</p> <p><b>Gaps</b> As shown in the Finer-grained STI analysis, the discipline of Arts and Humanities (which includes design, the fine arts and the applied arts) presents a lower specialisation index in SDG-oriented activities than in the EU13 and particularly EU27 countries. To address this gap, the design and applied arts sector must grow in size and/or focus more attention on SDG-related topics. Cultural and social innovation, engaged in the local communities and challenges, can be a strong driver in this regard.</p>
<p><b>Future Machines and Manufacturing Systems</b></p> <ul style="list-style-type: none"> <li>• General and specific purpose machines</li> <li>• Information in the Smart Management Service - Industry 4.0</li> <li>• Smart Components and Tools</li> </ul>	<p><b>Potential and opportunities</b> Future Machines and Manufacturing Systems have a horizontal role in supporting technification in industry and innovation (Goal 9) and improving employment (Goal 8).</p> <p>STI capacities, activities and technologies related to this priority can contribute to Goal 11. Sustainable Cities and Communities, which already presents a strong STI community. This could be an area of international competitiveness for the economy.</p> <p>Future Machines and Manufacturing Systems can also support the technification of the agricultural sector, complementing the innovations in Food for Future and contributing to Goal 2. Zero Hunger.</p> <p>Better production processes and industrial efficiency gains can have positive direct impacts in the environment, particularly in relation to water pollution (Goal 6), energy efficiency (Goal 7) and responsible production (Goal 12), and, indirectly, in the ecosystem (goals 13, 14 and 15).</p> <p>To support these transformations, SDG-oriented Engineering capacities in the country appear to be on par with EU27 and EU13 countries.</p> <p><b>Gaps</b> The main gap is a notably low scientific specialisation in necessary disciplines such as Computer Science, Mathematics, Materials Science and Physics, as well as in Business and Management.</p> <p>Furthermore Serbian institutions have a difficulty in competing in H2020's pillars Excellent Science, Industrial Leadership and Innovation in SMEs, which demonstrates a possible gap in applied sciences and advanced technologies.</p> <p>For these reasons, this seems to be a domain where investment and further international collaboration are necessary.</p> <p><b>Risks</b> The main risks associated to Future Machines and Manufacturing Systems in the context of the SDGs are related to automation, potentially leading to destruction of employment in traditional and lower-added value sectors, income inequality and the digital divide between leading companies and the rest of the private sector. Adequate corporate, labour, and education policies are necessary to guarantee the positive directionality of these techno-industrial developments in the context of the SDGs.</p>

<p><b>Energy Efficient and Eco-Smart Solutions</b></p>	<p><b>Potential and opportunities</b></p> <p>This is a clear domain of connection between smart specialisation and the STI capacities and opportunities related to the SDGs. During the participatory workshop in Belgrade, this priority domain was identified by stakeholders as a transversal lever for SDG-oriented transformations in all sectors and vertical priority areas.</p> <p>Directly connected to Goal 7. Affordable and Clean Energy, and more loosely connected to goals 11 and 12, which all present strong and entrepreneurial STI ecosystems.</p> <p>The potential is demonstrated by the high impact of related Serbian publications, the capacity to compete in Horizon 2020, the share of Innovation Fund projects and the large number of related patents.</p> <p>Biotechnology can support the production of energy from agricultural produce and waste. As such, it can provide opportunities related to Goal 2. Zero hunger.</p> <p>Energy Efficient and Eco-Smart Solutions can have an indirect positive impact on most social and environmental related goals, in particular 8, 9, 13, and 15.</p> <p><b>Gaps</b></p> <p>The scientific system related to Goal 7. is particularly small, while of great quality. Further investment to support the growth of the STI ecosystem, as well as wide collaboration with foreign partners could be necessary to achieve the desired impact and reach.</p> <p>Again, Serbia presents a weakness in basic and applied sciences disciplines (Physics, Materials Science, Computer Science, Biochemistry, Genetics and Molecular Biology) that could hamper the efforts.</p> <p>This gap is further demonstrated by the difficulty to compete in Excellent Science and Industrial Leadership calls in Horizon 2020.</p>
<p><b>Key Enabling Technologies</b></p>	<p><b>Potential and opportunities</b></p> <p>Key Enabling Technologies can have an important role in addressing Goals 2, 3, 6, 7, 8, 9, 11, 12, and 13. Serbia presents relative strength in Engineering, Chemistry and Chemical Engineering</p> <p><b>Gaps</b></p> <p>In most goals, Serbia presents weaknesses (lower specialisation index, relatively low impact, difficulty to compete in Excellent Science and Industrial Leadership calls in Horizon 2020) in basic and applied sciences disciplines (Physics, Materials Science, Computer Science, Biochemistry, Genetics and Molecular Biology, Immunology and Microbiology)</p> <p><b>Risks</b></p> <p>Technology is neutral, it can have positive, negative and unexpected effects on society and the environment. Anticipation and directionality are key to guarantee positive welfare development pathways. Responsible research and innovation practices (inclusiveness, participation, dialogue with representative stakeholders) can help steer technological development in the right direction, and adequate corporate, labour, and education policies are necessary to understand, address and mitigate the potential negative effects of technology-based transformations.</p>

As a summary of the previous table, the potential impact of the smart specialisation

priority domains in the main challenges in resulting from the SDGs in Serbia is synthetically listed below. Potential and opportunities are classified into direct and indirect. Direct potential and opportunities correspond to specific areas of innovation or application in the priority domains that tackle challenges within the SDGs directly, through science, technology and innovation, in most cases with economic or market potential for private stakeholders. Indirect potential and opportunities correspond to positive societal or environmental externalities which can be produced by the direct ones, and/or to wider developments and improvements in the practices of the priority domains that help tackle ingrained challenges within the SDGs.

## Summary of the potential impact of the S3 priorities on the main challenges resulting from the SDGs in Serbia

	Information and communication technologies	Food for Future	Creative Industries	Future Machines and Manufacturing Systems	Energy Efficient and Eco-Smart Solutions	Key Enabling Technologies
<b>Goal 1. No Poverty</b>	Indirect	Indirect				
<b>Goal 2. Zero Hunger</b>		Direct	Indirect	Indirect	Indirect	Indirect
<b>Goal 3. Good Health and Well-being</b>	Direct		Indirect		Indirect	Indirect
<b>Goal 4. Quality Education</b>	Direct		Direct			
<b>Goal 5. Gender Equality</b>	Indirect		Indirect			
<b>Goal 6. Clean Water and Sanitation</b>		Indirect		Indirect		Indirect
<b>Goal 7. Affordable and Clean Energy</b>	Direct	Indirect	Indirect	Indirect	Direct	Indirect
<b>Goal 8. Decent Work and Economic Growth</b>	Indirect	Indirect	Indirect	Indirect	Indirect	Indirect
<b>Goal 9. Industry, Innovation and Infrastructure</b>	Direct	Indirect	Indirect	Direct	Indirect	Direct
<b>Goal 10. Reduced Inequalities</b>	Indirect		Indirect			
<b>Goal 11. Sustainable Cities and Communities</b>	Indirect			Indirect	Indirect	Indirect
<b>Goal 12. Responsible Consumption and Production</b>		Indirect	Direct		Indirect	Indirect
<b>Goal 13. Climate Action</b>		Indirect	Indirect	Indirect	Indirect	Indirect
<b>Goal 14. Life Below Water</b>		Indirect	Indirect	Indirect		
<b>Goal 15. Life on Land</b>		Indirect	Indirect	Indirect	Indirect	
<b>Goal 16. Peace, Justice and Strong Institutions</b>						

Source: SIRIS Academic for European Commission, Joint Research Centre. Analysis based on Agenda 2030, the STI analysis and the Smart Specialisation for Sustainable Development Goals – pilot activity workshop in Serbia, Belgrade, February 27th 2020.

The precedent tables detail the potential, gaps and opportunities emerging from the smart specialisation priority domains towards the SDGs. To facilitate the reverse analysis, that is, which are the main S3-related capabilities that can support innovation and development pathways in the SDGs, the following table presents the top 3 most related S3 priority domains to each goal. It is based mainly on the nature and orientation of the Goal targets, and on the Finer-grained STI potential and knowledge/competence gap analysis.

## Most related S3 priority domains to the Sustainable Development Goals

Goal	Most related S3 priority domains
1. No Poverty	Food for Future Information and communication technologies
2. Zero Hunger	Food for Future Energy Efficient and Eco-Smart Solutions
3. Good Health and Well-being	Information and communication technologies Food for Future
4. Quality Education	Information and communication technologies Creative industries (Education and training is transversal to all)
5. Gender Equality	Information and communication technologies Creative industries (Gender Equality is transversal to all)
6. Clean Water and Sanitation	Food for Future (Sustainable Agrifood Production) Key Enabling Technologies (Biotechnology)
7. Affordable and Clean Energy	Energy Efficient and Eco-Smart Solutions Food for Future
8. Decent Work and Economic Growth	<i>Transversal to all S3 priority domains</i>
9. Industry, Innovation and Infrastructure	<i>Transversal to all S3 priority domains</i> Information and communication technologies
10. Reduced Inequalities	Food for Future Information and communication technologies
11. Sustainable Cities and Communities	Energy Efficient and Eco-Smart Solutions Information and communication technologies
12. Responsible Consumption and Production	Creative Industries (Smart Packaging) Food for Future (Sustainable Agrifood Production)
13. Climate Action	Energy Efficient and Eco-Smart Solutions Food for Future
14. Life Below Water	Creative Industries (Smart Packaging) Food for Future (Sustainable Agrifood Production)
15. Life on Land	Food for Future (Sustainable Agrifood Production) Creative Industries (Smart Packaging)
16. Peace, Justice and Strong Institutions	<i>Transversal to all S3 priority domains</i>

Source: SIRIS Academic for European Commission, Joint Research Centre. Analysis based on Agenda 2030, the STI analysis and the Smart Specialisation for Sustainable Development Goals – pilot activity workshop in Serbia, Belgrade, February 27th 2020.