# DESIRA

**DIGITISATION: ECONOMIC AND SOCIAL IMPACTS IN RURAL AREAS**

# D6.4 TRAINING KIT

## MAY 2023

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# D6.4 DESIRA TRAINING KIT

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|---|---|
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# 1. Introduction

This deliverable outlines the key objectives of the D6.4 Training Kit, which aims to develop capacity and accelerate knowledge creation in rural areas beyond those in direct contact with the DESIRA project. The report will compile all training materials delivered during the project's events in WP2, WP3, and WP4 in a structured, pedagogical approach.

The training kit aims to facilitate ongoing capacity building, impact assessment, and scenario development, and to disseminate DESIRA's guidelines for scenario development.

With an emphasis on innovative, competence-based learning, the DESIRA Training Kit actively contributes to the achievement of two out of the ten shared goals outlined in the Long-Term Vision for Rural Areas 2040. Firstly, it aligns with goal VII, which focuses on fully leveraging digital innovation by promoting equal access to emerging technologies, widespread digital literacy, and opportunities for advanced skill acquisition. The training kit serves as a proven methodology for implementing digital technologies in rural communities, ensuring a comprehensive understanding of both the opportunities and risks associated with the digital transformation of agriculture. By presenting DESIRA as a case study of best practices, it enables students to grasp the profound impact that digital literacy and innovation can have on the future of rural communities.

Moreover, the DESIRA Training Kit aims to contribute to goal VIII, which centers around fostering entrepreneurial, innovative, and skilled individuals who actively co-create technological, ecological, and social progress. By providing an educational framework, it enhances the skills of rural inhabitants, empowering them to generate new ideas and overcome ecological, social, and technological challenges. This not only equips individuals with the necessary capabilities but also stimulates the emergence of entrepreneurial mindsets within rural areas.

Additionally, the DESIRA Training Kit serves as a prime example of effective dissemination and exploitation of project results and materials, ensuring their continued usability and longevity beyond the administrative closure of the project. Users of the training kit gain the ability to replicate, adapt, reuse, and improve the training materials developed over the course of the past four years, thus contributing to the expanding knowledge base on rural digitalization.

Through these multifaceted contributions, the DESIRA Training Kit serves as a catalyst for advancing digital literacy, innovation, and sustainable progress in rural areas, facilitating the enduring impact of the DESIRA project and fostering a continuous evolution in our understanding of rural digitalization.

## 2. Objectives of DESIRA Training Kit

The D6.4 Training Kit is a critical deliverable of the DESIRA H2020 project, and the purpose of this report is to develop capacity and enable ongoing impact assessment and scenario development in rural areas, accelerate knowledge creation, and ensure that the knowledge created through DESIRA reaches a wider audience beyond those in direct contact with the project.

The objectives of this report are four-fold. First, the report aims to compile all the training materials delivered during the DESIRA events of WP2 (Assessing Past and Present Impact), WP3 (Developing Scenarios, Use Cases and Showcase Technologies), and WP4 (Policy Roadmap and Ethical Code). This will help in ensuring that the training materials are available to all stakeholders and can be used for future training sessions. Second, the report aims to provide an editorial update of the methodology illustrated in open-access reports D2.1, D2.2, D2.3, and D3.1. This will help in improving the methodology and ensuring that it is up to date.

Third, the report aims to disseminate the guidelines for scenario enabling their application in the creation of additional learning environments. This will help in ensuring that the guidelines are available to all stakeholders and can be used for future scenario development. Fourth, the report aims to compile the communication guidelines produced by DESIRA. This will help in ensuring that the communication guidelines are available to all stakeholders and can be used for future communication activities.

To achieve these objectives, we welcome all training materials that have been produced along the project, such as presentations at workshops, methodological guidelines, etc. In summary, this report will be a valuable resource for all stakeholders involved in the DESIRA project. It will compile all the training materials delivered during the project's implementation, provide an editorial update of the methodology, disseminate guidelines for scenario development, and compile communication guidelines produced by DESIRA. The report aims to enable ongoing capacity building, impact assessment, and scenario development while ensuring that the knowledge created through DESIRA reaches a wider audience.

## 3. Methodology of DESIRA Training Kit

The methodology used in this report involves the compilation of all the training materials used during the DESIRA events of WP2, WP3, and WP4. The purpose of this compilation is to provide a comprehensive overview of the training materials and guidelines used during the project's implementation, in order to enable ongoing capacity building, impact assessment, and scenario development.

A purely qualitative methodology was adopted, that is, a methodological approach that emphasises the collection and analysis of non-numerical data, such as text, images, and audio or video recordings. In the case of the training materials, the focus is on compiling existing qualitative data, such as presentation slides, reports, and guidelines, from the various workshops and events that took place during the project.

Once the relevant materials were identified and collected, a process of content analysis was employed to examine the data and identify key themes and patterns across the various documents. This involved a thorough review of the materials to identify common topics, issues, and approaches. The data was then coded according to these themes, allowing for an in-depth analysis of the data and identification of key findings.

The DESIRA Training Kit has been meticulously crafted using a comprehensive **pedagogical approach** encompassing three key elements. Firstly, it endeavours to provide a comprehensive technical understanding of rural digitalization, with a specific focus on exploring the potential opportunities and challenges that arise within rural contexts. Secondly, it delves into the intricacies of the policy landscape, particularly at the European Level, enabling participants to grasp the essence of prevailing policy initiatives, trends, and prospects related to various facets of rural digitalization. Lastly, the training kit embraces a practical educational approach by furnishing practical guidelines and training materials, thereby creating an authentic framework for replication, enhancement, and utilization of these resources in real-world scenarios. Furthermore, the DESIRA Training Kit embraces and draws inspiration from the concept of diversity within the European Union. As a result, the training materials have been thoughtfully designed to be easily adaptable, aligning with the principles of multiculturalism and plurilingualism of the EU. Remarkable research and attention have been dedicated to integrating these values into content-based teaching, ensuring that the training kit fosters inclusivity and accommodates various cultural and linguistic backgrounds, with special attention to the rural background. In fact, in-depth exploration and analysis of relevant literature on the incorporation of these values into educational practices have been conducted (Coyle, 2007), further enriching the content and pedagogical approach of the DESIRA Training Kit.
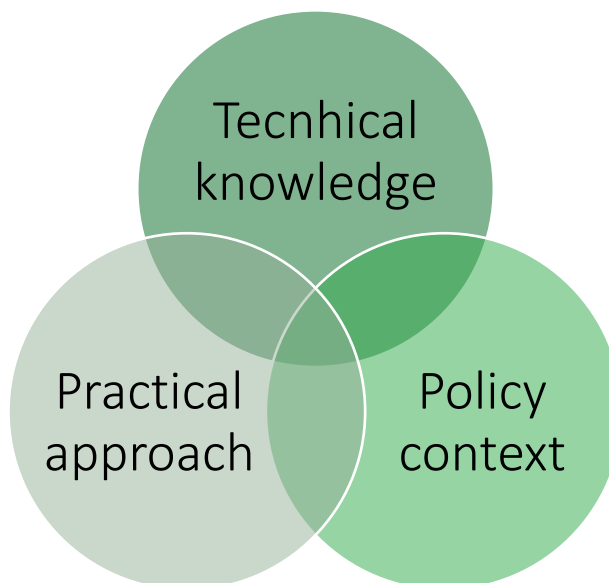
**Figure 1. Pedagogical approach of DESIRA Training Kit.**

Finally, DESIRA Training Kit have been designed based on two main guiding principles, which constitute its **methodological approach**. The ideas of innovative formal education and competence-based learning are consequently of remarkable importance to this training kit's methodological approach.

In the first place, this training kit are based on the ideas of innovative formal[1] learning. With innovative formal education, we refer to a progressive and forward-thinking approach to education within structured, organized, and traditional learning settings but that challenges conventional instructional approaches by incorporating cutting-edge educational tools, interactive technologies, project-based learning, collaborative activities, real-world applications, and interdisciplinary approaches. It seeks to foster critical thinking, problem-solving skills, creativity, and adaptability among learners, preparing them for the complexities of the modern world. It encourages experimentation, exploration, and the development of 21st-century skills, such as digital literacy, collaboration, communication, and entrepreneurship. By applying this term, DESIRA Training Kit aims at leading by example, using a more innovative training approach.

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[1] With formal education, we refer to "purposive learning that takes place in a distinct and institutionalised environment specifically designed for teaching/training and learning. Learning aims are almost always externally set, learning progress is usually monitored and assessed, and learning outcomes are usually recognised" (Chisholm, 2005)
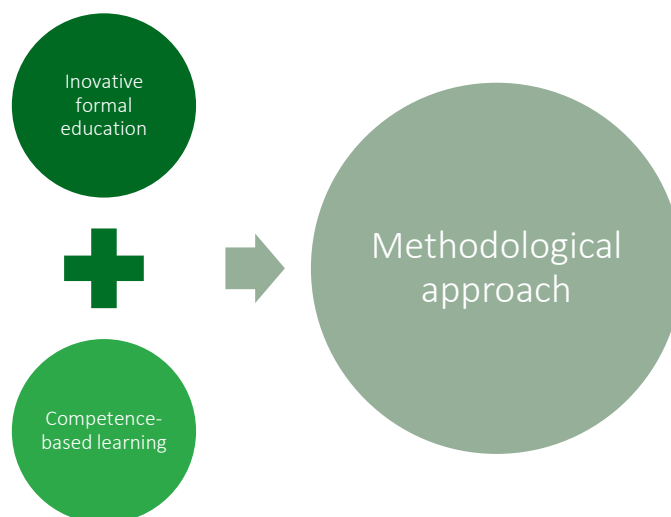
Figure 2 Methodological approach of DESIRA Training Kit.

In the second place, our methodology is based on the idea of competence-based learning. Competence-based teaching, also known as competency-based education (CBE), is an instructional approach that focuses on the development and assessment of specific competencies or skills that students should possess by the end of a course. It aims to prepare students for the challenges they will encounter in their professional lives by equipping them with the specific competencies and capabilities required in their chosen field. Competence-based teaching shifts the focus from content-centric instruction to a more skill-oriented approach, aligning education with the practical needs of industries and professions, and promoting the development of well-rounded, competent individuals (Chappel et al.2021). By embracing this concept, the DESIRA Training Kit strives to cultivate a "learning by doing" approach, placing significant emphasis on the value of practical, skill-oriented training.

In conclusion, with this methodological and pedagogical approaches, the training kit recognizes that true mastery and comprehension are best achieved through hands-on experiences and active engagement with real-world scenarios. It promotes a shift from passive learning to active participation, empowering learners to acquire and apply skills in practical contexts. By immersing students in experiential learning opportunities, the DESIRA Training Kit fosters a deeper understanding of the subject matter, enhances critical thinking abilities, and enables individuals to effectively transfer their knowledge into practical settings.

## 4. Intended audience

DESIRA took inspiration, as planned in the Grant Agreement, from the AGRISPIN Training Toolkit to produce its own toolkit. The purpose of the toolkit is to provide a ready-made set of materials that have been tested as a result of the practice and expertise developed from

DESIRA activities so that practitioners, projects carrying over the legacy of DESIRA such as CODECS, GRANULAR, RUSTIK, SMARTERA, FUTURAL or RURACTIVE can start from the methodological and practical lessons learned from the design and implementation of the various activities carried out during the life of DESIRA. This also includes important questions around ethical issues, and a dedicated subsection has been specifically addressing this. In this way, other project partners and participants can build on them rather than starting from scratch all over again.

However, the added value in terms of audience goes well beyond the environment around the present and future Horizon projects themselves. As indicated in Deliverable 6.3 many of these materials have tested in training seminars and academic workshops with practitioners, often involving hundreds of participants over the course of the four years of the life of the project. Thus, students and practitioners keen to apply the methodologies spelled out in this training kit will be able to peruse what is a well tried and tested set of materials that in so doing particularly allow themselves to be replicated and built upon, as they have emerged from real life practice.

In sum, the training kit is targeted at:

- Practitioners in the field of rural development and farm advisory services, for whom the training kit will provide tools for facilitating interactive innovation centred upon digitalisation, analyse community needs and expectations and designing local digitalisation strategies

- Students in the field of agriculture and rural development, as future farm advisors

- Students in the field of information technologies, as future technology developers of solutions for agriculture and rural development

# 5. The Training Kit

Since DESIRA started in June 2019, leaders of WPs 2, 3 and 4 have carried out numerous training activities that have been compiled in this report (D6.4). The activities comprised navigate between the concepts of impact assessment, policy understanding and capacity building for innovation on rural areas.

This training material is organized in the first place by Work Packages (WP) and then by chronological order, aiming at improving the general understanding of the process distribution and development.

The first chapter of this material includes the tools developed under the WP2: Assessing Past and Present Impact. It presents a comprehensive approach to the context of rural

digitalisation, its impact on areas as capacity building or ecological transition and a overview of structures as Living Labs and Smart Villages.

The second chapter, that corresponds to the WP3: Developing Scenarios, Use Cases and Showcase Technologies consists on a series of guidelines for improving capacity development at the local level in techniques as workshops organization and digital storytelling.

Finally, our last chapter, which deals with WP4: Policy Roadmap and Ethical Code focus     on training on National Policy Analysis, specifically on digitalization of agriculture and other DESIRA main topics.
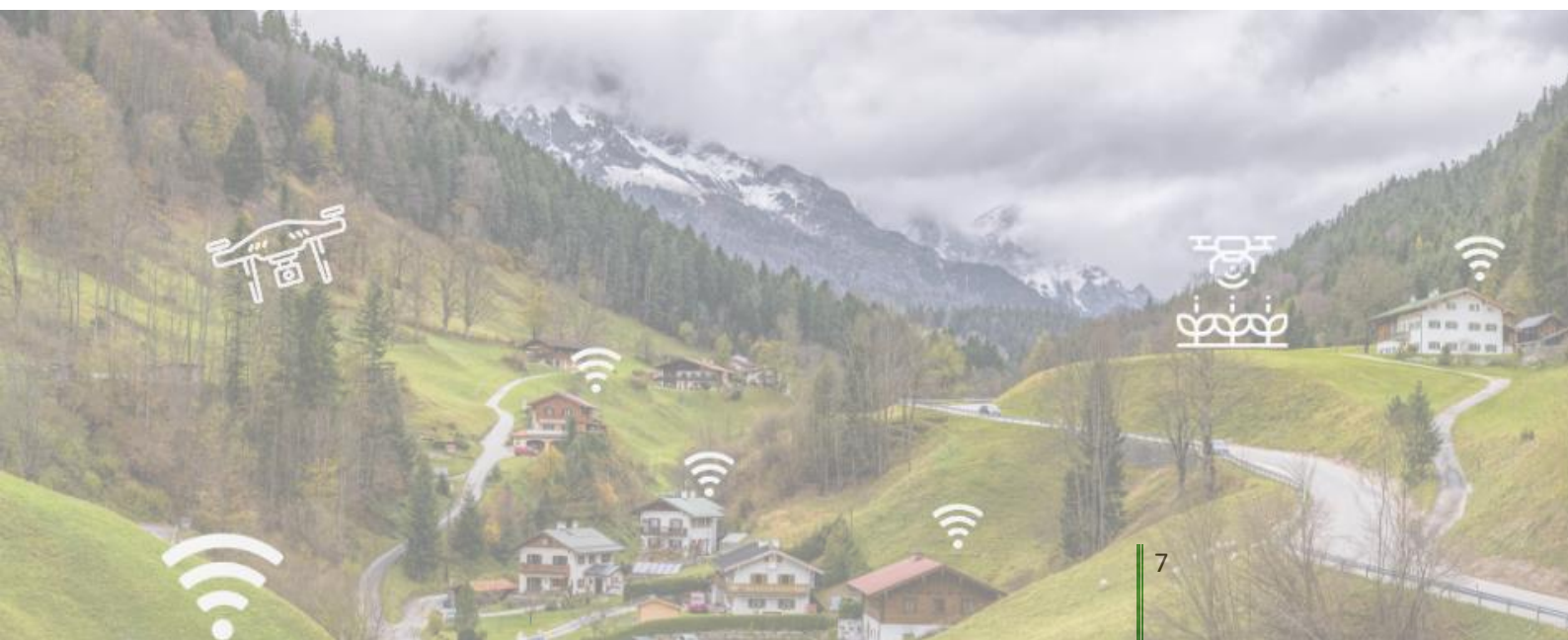
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# TRAINING KIT

# DESIRA Training Kit: objectives and guiding principles

In the following Training Kit, we present a comprehensive set of tools and guidelines aimed at enhancing knowledge and capacity building in the field of rural digitalization. Our training materials encompass a range of methodological examples carefully curated to facilitate the assimilation of DESIRA's wealth of knowledge by students and other interested stakeholders. Embracing the wisdom of Leonardo Da Vinci, who famously proclaimed that *"learning never exhausts the mind"* this toolkit underscores the transformative power of training, emphasizing the immense opportunities it offers to those being taught.

In this context, we perceive training as a dynamic process through which individuals acquire the skills necessary for a specific purpose, be it in their professional, artistic, or sporting endeavours (Council of Europe Glossary, 2023). To effectively support this process, a well-defined methodology, rich experiences, and relevant contextual information need to be provided. The primary objective of this Training Kit is to furnish educators with a comprehensive framework that empowers them to design their own path to successful training outcomes. It serves as a practical tool, facilitating the learning journey for both formal students and stakeholders engaged in the realm of rural digitalization.

By engaging with this Training Kit, learners will be equipped with the necessary tools and resources to navigate the intricate landscape of rural digitalization, fostering their understanding and enabling them to actively contribute to this transformative domain.

# WP2: Assessing Past and Present Impact

This work package, led by the University of Pisa, aimed to establish a common understanding and language among the project participants, by developing a framework that defines key concepts, identifies research hypotheses, and develops research questions related to digitisation. The main objectives were to develop an interdisciplinary and transdisciplinary Conceptual and Analytical Framework, and to create a Taxonomy and Inventory of Digital Game Changers.

In order to address the challenges of digitisation in rural areas, it was crucial to establish a shared knowledge base and develop a common understanding of the key concepts related to this topic.

This work package helped achieve this goal by creating a Conceptual and Analytical Framework that integrates interdisciplinary and transdisciplinary perspectives. The framework provided a structured approach to analysing the impacts of digitisation in rural areas, identifying key research questions and hypotheses, and guiding future research.

In addition to the framework, this work package also created a Taxonomy and Inventory of Digital Game Changers. This provided a comprehensive overview of the different types of digital technologies and innovations that are currently being used or have the potential to be used in rural areas. The taxonomy will help researchers, policymakers, and other stakeholders to better understand the potential impacts and opportunities of digitisation in rural areas.

Overall, this work package played a critical role in filling the knowledge gap about digitisation in rural areas by establishing a shared language and understanding among project participants, and by providing a structured approach to analysing the impacts of digitisation and identifying key research questions and hypotheses.

The training material from WP2 comprises:

- Training of Living Labs

- Rural digitalisation: Overview and impacts

- Smart Villages: Policy Context

- How to improve the capacity to respond to the challenges and opportunities of digitalisation in rural areas?

- The ecological transition and the potentials of digitalisation

## Training Living Labs

This training material is designed to provide guidance on the Training of Living Labs. It aims to help individuals and organisations understand the concept of Living Labs and how to establish and operate them effectively. The material covers topics such as context analysis, assessment of needs, and the journey of Living Labs.

It provides valuable insights into the socio-cyber-physical system related to the focal question of Living Labs, as well as the impact assessment process for these labs. Overall, the training material below is a comprehensive guide for anyone interested in learning about Living Labs and how they can be used to drive innovation and growth in various industries.

Living Labs' journey...

I am ready to start!

4. LL individual report

3. Participatory impact assessment

2. Describing the SCP system

1. Analysis of context, assessment of needs, selection of SESI

0. Preparatory activities

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Setting the frame

CONTEXT

Social Domain

Socio-Cyber Interactions

Socio-Physical Interactions

SCPS

Cyber Domain

Cyber-Physical Interactions

Physical Domain

Socio-cyber-physical system related to the LL's focal question

Time 0

Time 1

Time 2

Past

Current situation

Future scenarios WP3

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# How to do the context analysis across the LLs

- In DESIRA, the context can be broadly understood as the domain (agricultural, rural, forestry) and area in which the LL operates

- A context can be analysed:

  o **at different levels:** community, municipality, province, region, cluster of regions, country, etc.
  o **with different timeframes:** months, years, decades, etc.
  o **by looking at different topics:** income, inequality, policy, digitalization, etc.
  o **with different methods:** multicriteria analysis, trend analysis, SWOT analysis, interviews, focus groups, etc.
  o **With different approaches**: qualitative, quantitative, mixed

- A context analysis aims to gain background information on relevant trends and conditions which might influence needs, objectives, outcomes, etc. of the SCP system related to the LLs focal question

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# Steps for the context analysis and assessment of needs

1. Collect qualitative and quantitative evidence

2. Organise the evidence through the SWOT analysis

3. Assess the needs based on the SWOT analysis

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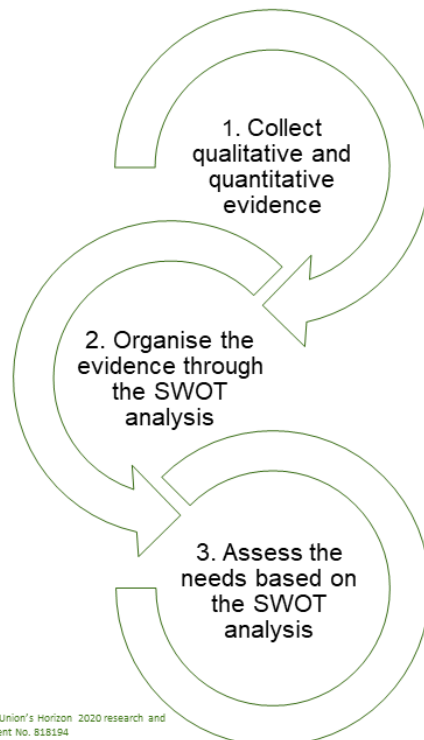
# 1. Collection of qualitative and quantitative evidence

| Elements of context analysis | Common elements across LLs | Based on the LLs situation |
|---|---|---|
| Level of analysis | / | We suggest focusing on levels below regions (NUTS-3), e.g. Land Administration Units for rural areas. But this choice will depend on the focal question of your LL (some forest can cover multiple regions) and data availability |
| Timeframe | We suggest to consider the last 10 years | Up to the LLs → please describe it |
| Topics | Level of digitalisation and conditions affecting the access | Additional specific topics relevant for your focal questions (e.g. demography, tourism, biodiversity, communication) |
| Method | 1. Secondary data collection<br>2. Qualitative semi-structured Interviews | We suggest organizing a small brainstorming or internal meeting to discuss the SWOT and assessment of needs, but this is optional and depends on your availabilities |
| Approach | Mixed (using quantitative data and qualitative information) | / |

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# a) Secondary data collection

- Related to the focal question

- You can refer to trends (longer timeframe) or single snapshots (statistics in a given moment)

| Examples of topics to consider when analysis the context |
|---|
| Group age distribution (are elder people relevant?) |
| Depopulation (emigration rate, birth rate, etc.) |
| Economic conditions (income level, householder expenditure, etc.) |
| Social asymmetries (female employment rate, relative poverty rate, etc.) |
| Education (tertiary education rate, presence of high schools, etc.) |
| Sustainability (use of renewables, organic food expenditure, etc.) |
| *Digitalization and conditions affecting its access (level of connectivity, people using the net for interact with public authorities, etc.) ?? |
| Please, consider other factors, if it is necessary |

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## Some tips for secondary data collection on the level of digitalisation

- **Pay attention on the reporting of data/figures in the final template** (headings, sources, year, reference)

- **Balance your time and focus →** assessment of **impacts** vs **level of digitalisation →** don't get lost in secondary data collection

**Figure XX:** European Broadband Mapping
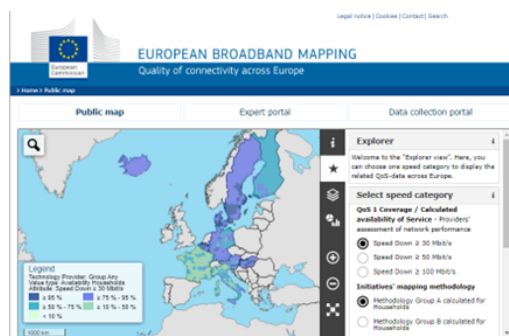


*Source: European Commission (2017)*

European Commission (2017) European Broadband Mapping . Retrieved on 13 May 2020, https://www.broadband-mapping.eu/public-portal/

DESIRA receives funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 818194

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## b) 5-10 semi-structured qualitative interviews

What is the current level of digitalisation in the **context** in which your LL operates (from low to high)? *Please provide your average estimation and comments*

| Dimensions of DESI | Very low | Low | Medium | High | Very high |
|---|---|---|---|---|---|
| **1. Digital connectivity** It refers to the deployment of broadband infrastructure and its quality. | Any other comments/information (max 500 characters): | | | | |
| **2. Digital skills** It refers to skills needed to take advantage of the possibilities offered by digital. | Any other comments/information (max 500 characters): | | | | |
| **3. Use of Internet Services by citizens** It accounts for a variety of online activities, such as the consumption of online content (videos, music, games, etc.) video calls as well as online shopping and banking. | Any other comments/information (max 500 characters): | | | | |
| **4. Integration of Digital Technology by businesses** It refers to the digitisation of businesses and e-commerce. | Any other comments/information (max 500 characters): | | | | |
| **5. Digital Public Services** It refers to the digitalisation of public services, focusing on eGovernment and eHealth | Any other comments/information (max 500 characters): | | | | |
| **6. Women in digital** It refers to the level of participation of women in the digital economy and society. | Any other comments/information (max 500 characters): | | | | |

## 3. SWOT analysis

| STRENGTH | WEAKNESSES | OPPORTUNITIES | THREATS |
|---|---|---|---|
| Factors internal to your context | | Factors external to your context | |
| • Qualities that distinguish your context from others<br>• Things that in your context are done well<br>• Conditions that make your context unique<br>• Level and access to digitalisation | • Long term and persistent problems in your context<br>• Things that your context lack<br>• Things that other contexts do better<br>• Resource limitations<br>• Level and access to digitalisation | • External trends and development which can offer new possibilities to solve problems<br>• Social, market, technological, policy development in the last years<br>• Level and access to digitalisation | • External trends and development which can worsen specific problems<br>• Etc.<br>• Level and access to digitalisation |

- Based on quantitative and qualitative evidence

- Related to the focal question

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## 4. Assessment of needs

- Based on the SWOT analysis
- Linked to the focal question
- Select only the most important (e.g. five needs)
- Needs are not the repetition of the weaknesses of the SWOT)
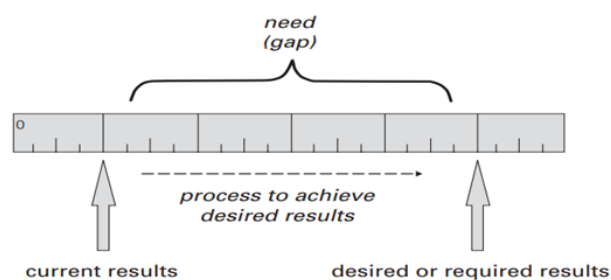


*Source:* Based on Kaufman, Oakley-Brown, Watkins, and Leigh (2003) and Watkins (2007).

1. Needs can end up with a wish list
2. Needs can be prioritized (high, low, medium)
3. Linked to specific actors (LLs, stakeholders)
4. Can be formulated quantitatively or qualitatively
5. Can be distinguished in strategic, tactical, operational

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## 4. Assessment of needs (up to five)

| Short heading/title of the need | Short description | Who is that needs this? (LL, farmer association, broad society, tourist, forestry holding, etc.) |
|---|---|---|
| 1. Increase transparency in long-distance food supply chains based on small scale farmers' direct selling | Better information for consumers living abroad on environmental and quality properties of food products (e.g. carbon footprint, year of production, country of origin, variety, method of production) | • Consumer groups living abroad<br>• Small scale farmers involved in direct selling activities |
| 2. | | |
| 3. | | |
| 4. | | |
| 5. | | |

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## Further references

**See example of SWOT analysis and assessment of needs for smart villages (Pag. 2)**

https://enrd.ec.europa.eu/sites/enrd/files/enrd_publicati ons/smart-villages-briefs- finland_future_cap_strategic_plans.pdf

**Book about how to do a SWOT analysis (pag. 127) and assessment of needs**

Watkins, R., Meiers, M., & Visser, Y. (2012). A guide to assessing needs essential tools for collecting information, making decisions, and achieving development results. Washington, D.C.: World Bank.

**DESI indicators**

https://ec.europa.eu/digital-single-market/en/desi

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# Procedures and templates

### Related to Data management Plan and Guidelines

## Procedures for the LLs – Repositories

Two data and information repositories

Private or public link

**OPEN:** LL public folder in DESIRA VRE

LLs upload all the deliverables in English. Each LLs will receive a template for reporting main deliverables

**Workspace >VRE Folders >DESIRA_Project >2. Work Packages data and reports >WP 2 Assessing Past and Present Impact >Living Labs folder**

**RESTRICTED:** LL private folder in its own VRE

LLs decide who can access and the language.

**LLs can store intermediary outputs for the final deliverables (e.g. full transcriptions of workshop minutes, interviews or consent forms in national language**

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## Procedures for the LLs – Language aspects

- Interviews, workshops, secondary data collection can be conducted, collected, transcribed in your national language

- However, final deliverables (LLs report and its annexes) should **be written rigorously in EN**

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## Procedures for the LLs – Timeline and templates

1. The Template of the LL individual report will be sent to you within the next two weeks

2. The Template will be the tool for reporting your final deliverables of WP 2

3. The results of the Context analysis and assessment of needs shall be reported in the template of the LL **by 03rd August 2020, or at any earlier time!**

4. Once you completed the above point 3, **please upload the draft template in your LL public folder on the VRE and send an email to fabio.bartolini@unipi.it (cc: matteo.metta@phd.unipi.it) to inform about the completion of this first activity**

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## Procedures for the LLs – Consent form

- Translation of the informed consent form in an understandable/native language for the research participant (if needed);

- Before starting the interviews and the workshop, get the informed consent form through the following options:
  - signed and scanned form;
  - email from the interviewed containing the text of the consent form;
  - online consent form

- After the interviews and the workshop:

  - **ORGANISATION WITH INTERNAL PRIVACY POLICY AND DPO →** forms gathered shall be stored securely on file by the partner, according to the organisation's security rules.

  - **ORGANISATION WITHOUT A DPO →** forms gathered shall be stored in a repository managed by UNIPI.

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# Rural digitalisation: Overview and impacts

This training material provides an overview of the topic of rural digitalisation, including the difference between digitisation and digitalisation, the implications of digitisation, and the transition from digitisation to digitalisation.

It also explores the socio-economic impacts of ICT-related innovation in rural areas and provides information on how digitalisation has led to the development of digital ecosystems and new business models, products, and practices.

The purpose of this training material is to help individuals and organisations understand the impact of digitalisation in rural areas and how to manage innovations like digitalisation while avoiding social risks. It also provides guidance on how to anticipate failures, take into account societal concerns, and identify necessary adaptations of the environment.

This training material is an improved and summarized version of the training materials presented during the years 2019-2022.

Digitisation or digitalisation?

*Digitisation: Process by which analogic information is codified into numbers*

PAGE



Digitisation changes the objects of everyday life

PAGE

Implications of digitisation

Digitised information is:

- Storable
- Accessible
- Replicable
- Transmittable



THE DIGITAL EVOLUTION – STEP BY STEP.

Impact of Cloud & Artificial Intelligence

+ 40 Years

Copyright 2018, Rene Buest, http://renebuest.com

Implications of digitization



Newspapers: Corriere della Sera

Digitisation as development of an infosphere
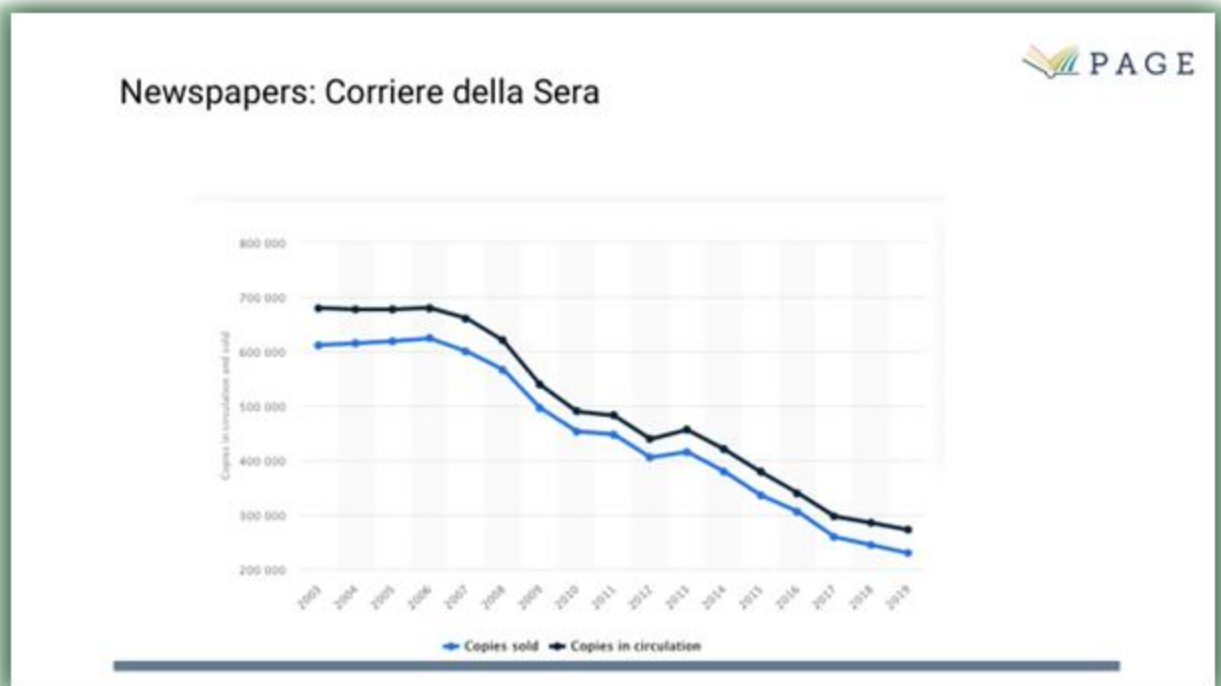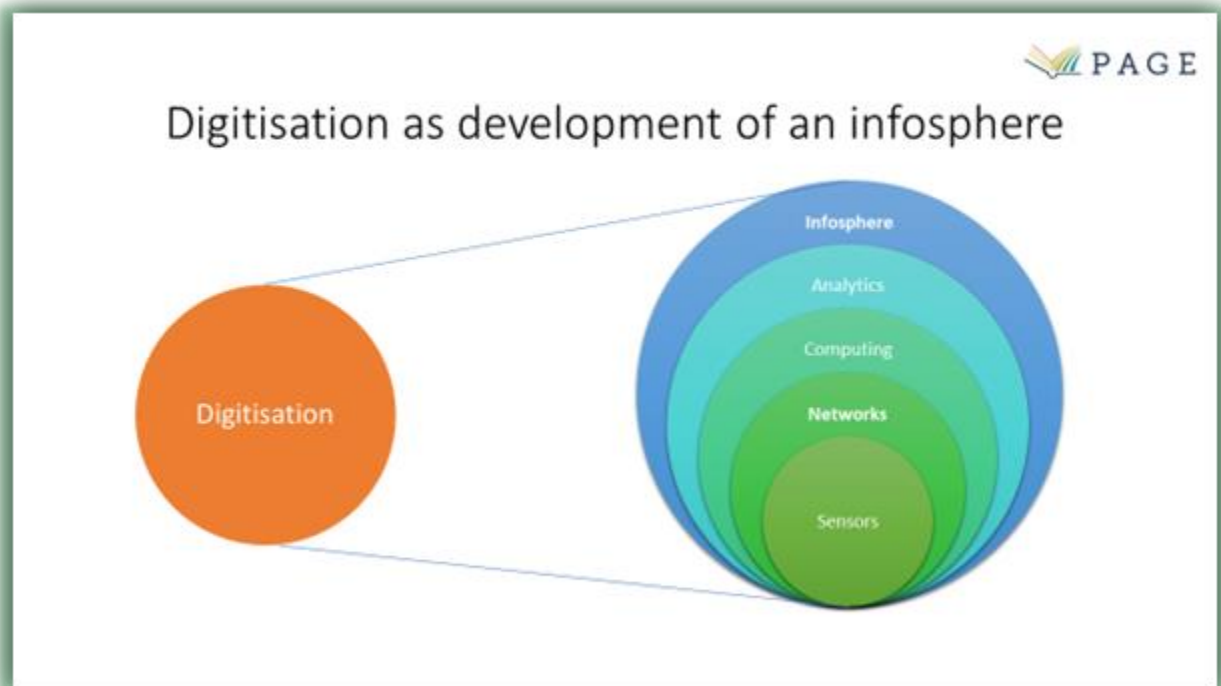


Functions of digital technologies

## New modalities of interaction



## Virtualisation

**Monitoring and tracking**



**Simulation and forecasting**
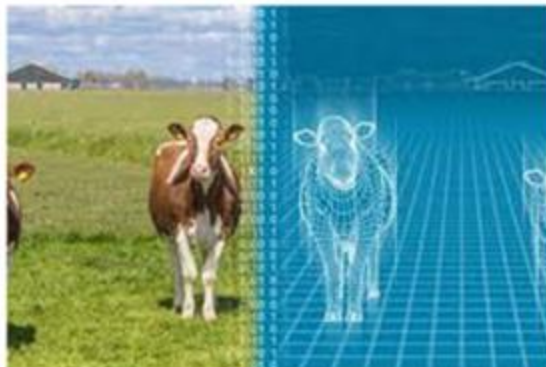


- A digital copy of real objects
- Real time update of the state of the system
- Simulation for prediction

PAGE

Digitalisation as development of digital ecosystems
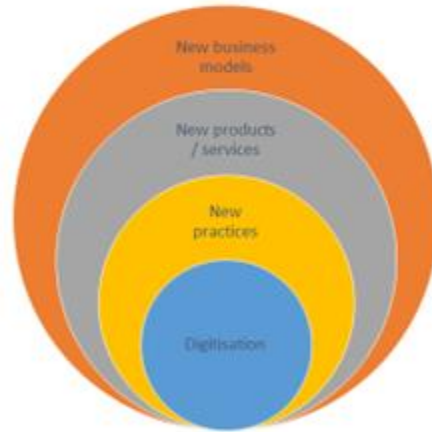


Digitalisation of the tourist sector

The domains of impact

Economic

Social

Environ
mental



Economic impact

**PAGE**

### FALLING COST OF COMPUTE AND STORAGE[4] (IN DOLLARS)

Compute cost ($ per 1 million transistors)     Storage cost ($ per gigabyte)



## Moore's Law: Transistors per microprocessor
Number of transistors which fit into a microprocessor. This relationship was famously related to Moore's Law, which was the observation that the number of transistors in a dense integrated circuit doubles approximately every two years.



Source: Karl Rupp. 40 Years of Microprocessor Trend Data.                    CC BY

Information as a commodity

Non rivalrous

Non-excludable

Zero marginal cost

Figure 2-17 The evolution towards 'zero marginal costs' for digital goods
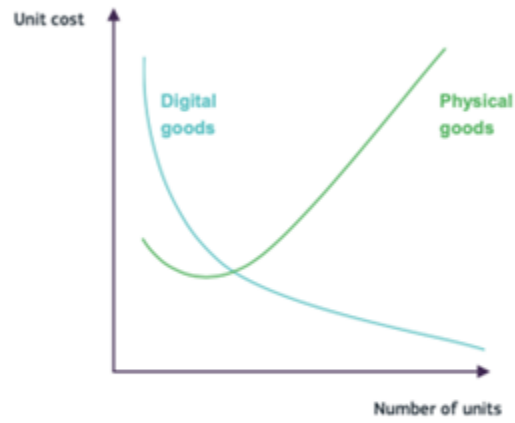
Source: DG Research and Innovation, Chief Economist – R&I Strategy & Foresight Unit, based on Essays, UK (2018) and Rifkin (2014)
Stat. link: https://ec.europa.eu/info/sites/info/files/srip/2020/part/chapter2/figure-2-17.xlsx



## The value of networks
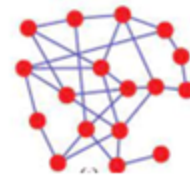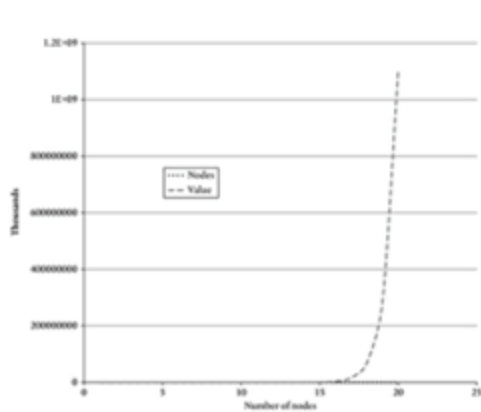
$$V = n^2$$

## Industrial revolutions

### Third industrial revolution

- Automation
- Communication
- Sharing economy
- Working at a distance
- E-commerce
- Disintermediation

### Fourth Industrial revolution

- Artificial intelligence+automation
- Biotechnologies
- 3D printing
- Internet of things



**Business models**
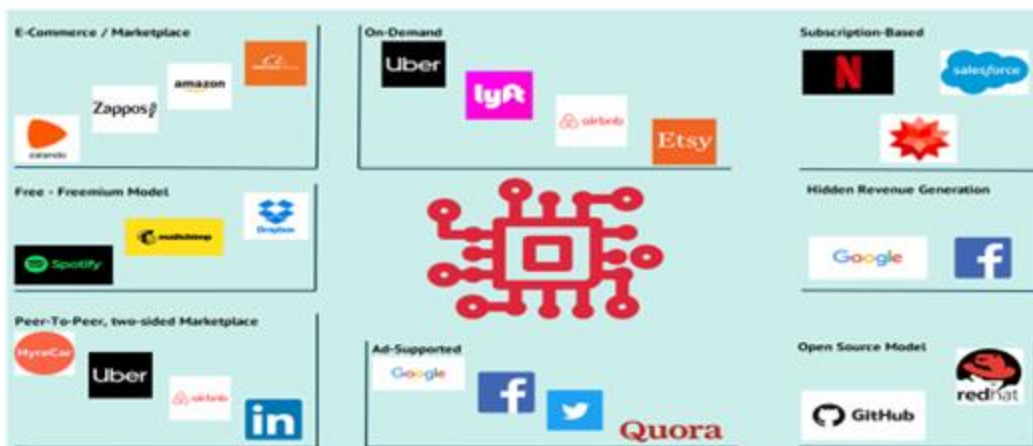
Social impact



Daily life: Facebook

1,65 billions of users

50 minutes/day each

TECH

# Facebook's outage has people rethinking how they make money online

PUBLISHED SAT, OCT 9 2021-9:36 AM EDT

**Samantha Subin**
@SAMANTHA_SUBIN

SHARE f 🐦 in ✉

**KEY POINTS**

* Influencers who long relied on Instagram and Facebook to connect with users, advertise and sell products are rethinking where they post content after Monday's outage.

* CNBC spoke with ten creators and small business owners who use a combination of Instagram, Facebook and WhatsApp, and said losses ranged from a few hundred dollars to at least $5,000.

* The outage comes as Facebook and Mark Zuckerberg push investments in content creation to woo influencers from the likes of TikTok.

📺 TV

**Dateline** WATCH LIVE ⊙
UP NEXT | Dateline 3:00 AM ET    Listen

SAUDI GREEN INITIATIVE



📖 PAGE

# Onlife

**Fig. 1.1** Three strands of social digitalisation

PAGE
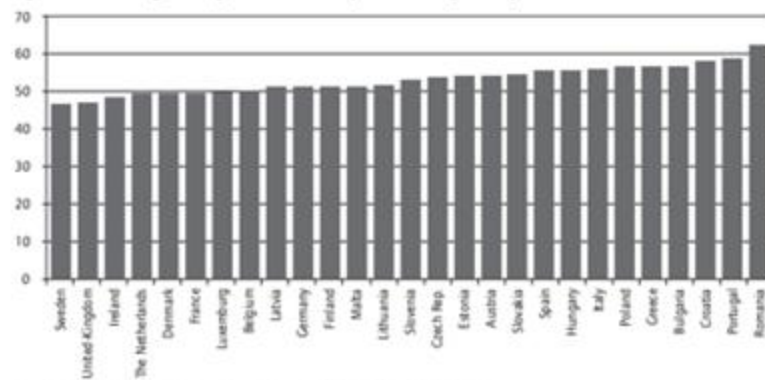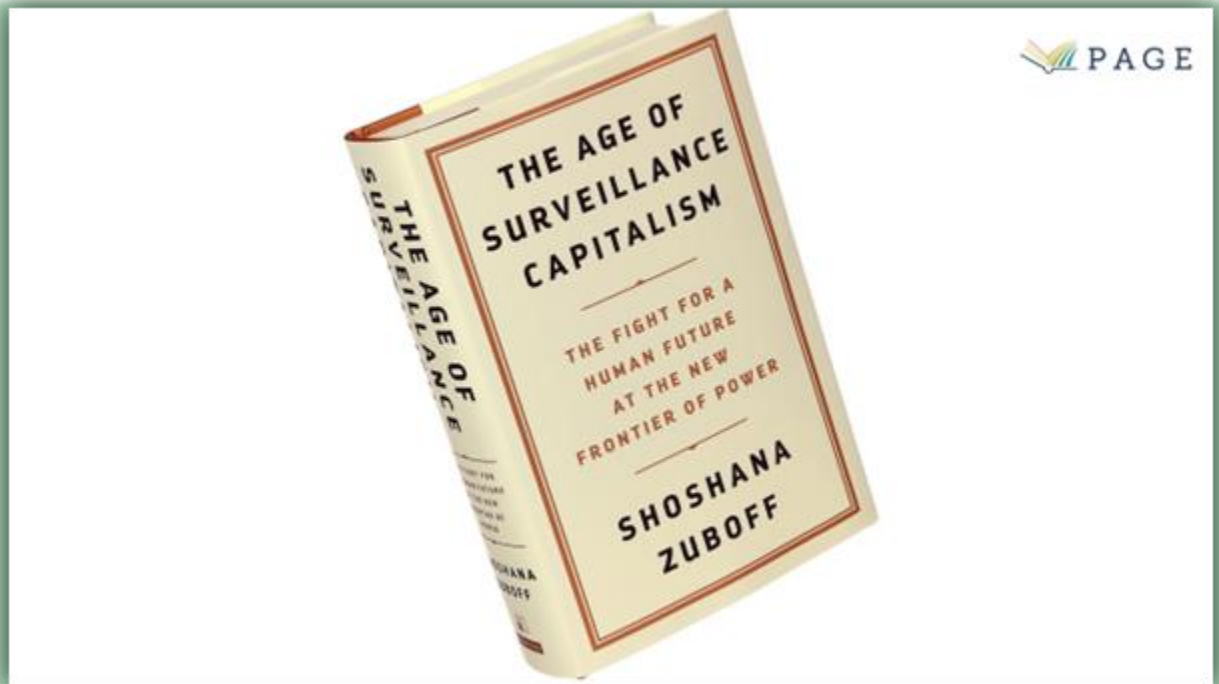
# Environmental impact

PAGE

**A Minute on the Internet in 2019**
Estimated data created on the internet in one minute

3.8m requests G

347,222 scrolls

1m views

87,500 people
on Twitter

4.8m GIFs
served

$996,956
spent online

390,030
apps downloaded

1m logging in

4.5m
videos watched

2.1m
snaps taken

1.4m swipes

46,200
new posts

694,444 rs watched
GPW-18_Report_20211110.docx

188m
emails sent

41.6m
messages sent

60 Sec

Sources: Lori Lewis & Officially Chad via Visual Capitalist

statista

MIT Technology Review

Topics   Magazine   Newsletters   Events

Artificial intelligence / Machine learning

**Training a single AI model can emit as much carbon as five cars in their lifetimes**

Deep learning has a terrible carbon footprint.

by **Karen Hao**                                June 6, 2019



## Smart Irrigation (AWD) – carbon savings and carbon credits certification

**Potential Environmental Benefits of AWD:**

**Annual Water savings:**
80,000 US gallons per acre

**Annual GHG savings:**
0.28 metric tons CO2e per acre

Sources of GHG Savings

■ Pumps, 0.06 tCO$_2$e per acre
■ Fertilizer, 0.11 tCO$_2$e per acre
■ Methane, 0.11 tCO$_2$e per acre

American Carbon Registry

Automated Irrigation

Smart Buildings — Building Energy Management Systems (BEMS)
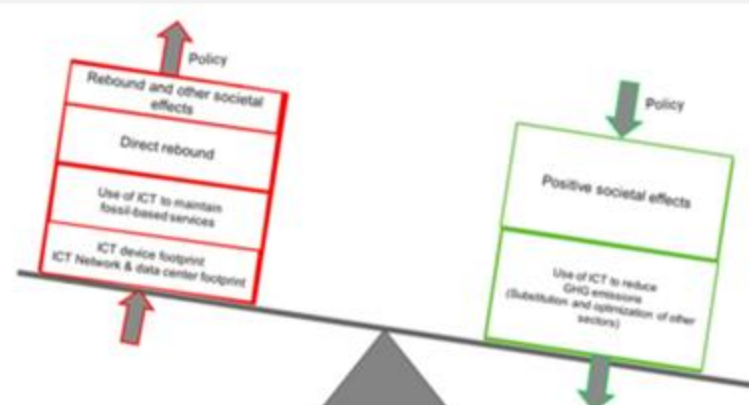


Overview of indirect effects

## Purposes of digital innovation

| | | | |
|---|---|---|---|
| Resource efficiency | Quality of products | Quality of work | work organization |
| Cost reduction | Business intelligence | Visibility, reputation | Access to market |
| Administration | Coordination (internal, across the value chain) | Quality of the environment | Health |
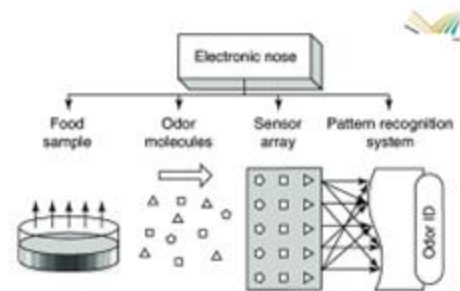
Quality of products

Quality of work: manure

PAGE



Work organization

**In agriculture**

- Satellites —> land, climate
- Sensors —> position, humidity, temperature, contaminants
- Drones —> data collection, on spot operations
- Unmanned vehicles , robots—> labour productivity
- Internet of things —> automation
- Social networks —> social capital, access to information
- Remote communication → coordination
- Virtual and augmented reality → increasing peoples' capacities



**Rural life**

Rural business



Rural administration

How to assess the socio-economic impact of digitalisation?



A system approach
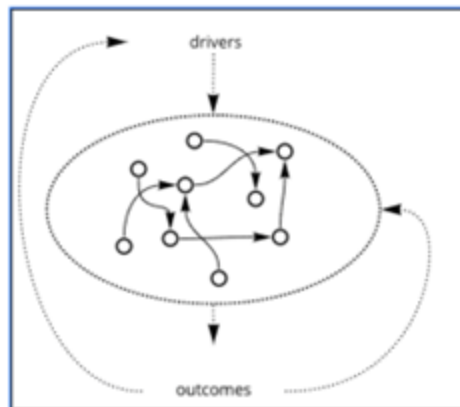
## A socio-technical system

| Actors | Activities | Things | Rules |
|---|---|---|---|
| • The cow<br>• The farmer | • Cleaning the udder<br>• Stimulating the udder<br>• Collecting the milk | • The udder<br>• The container<br>• The tools for cleaning<br>• The tools for stimulating the udder | • clean well<br>• control the sanity of the udder<br>• stop milking when there is no more milk |
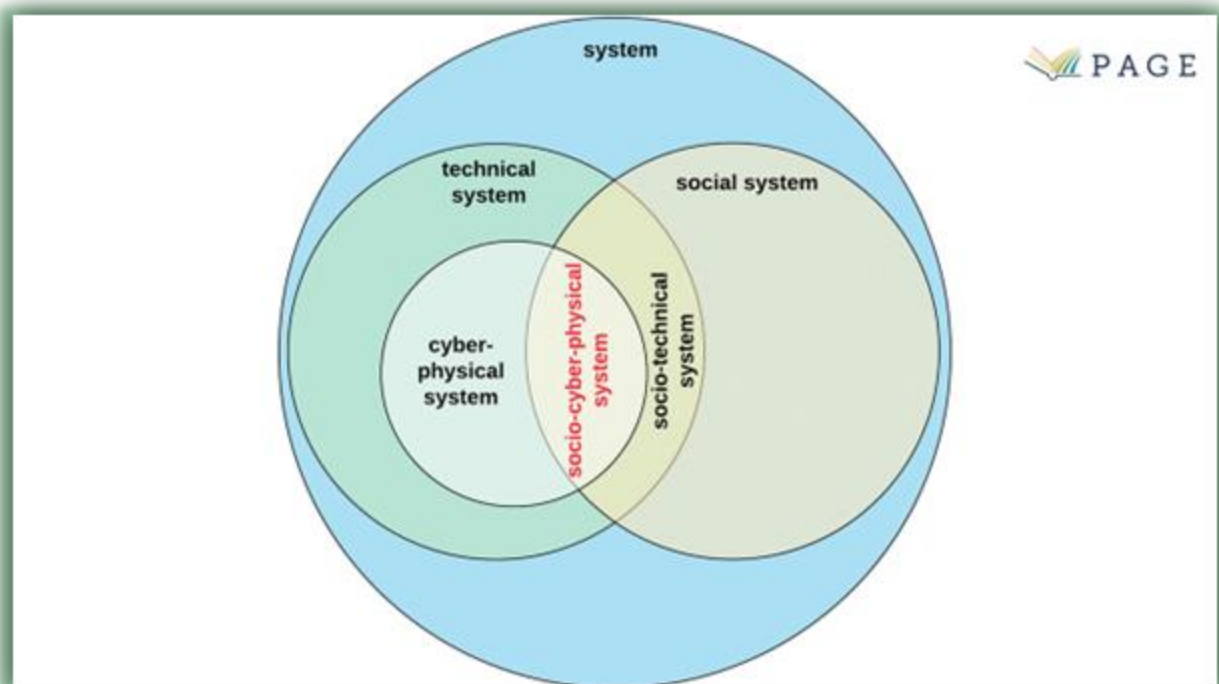
## A technical system
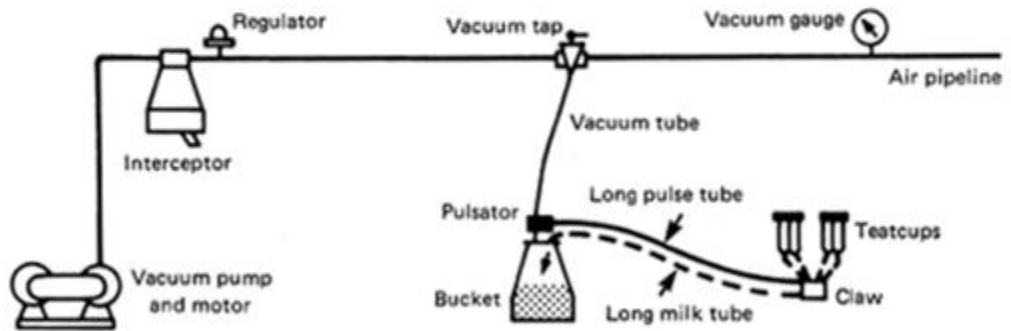


(a) Bucket (cowshed)

## A social system

A cyber system



A cyber-physical system

Figure A 13: LL France (Végépolys Valle). Visualisation of SCP system related to the competitiveness of the French horticultural sector
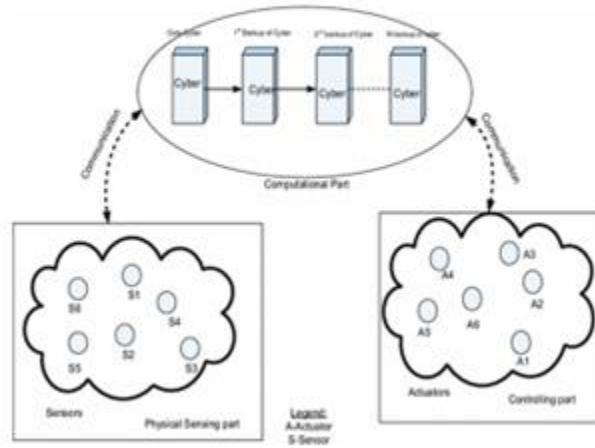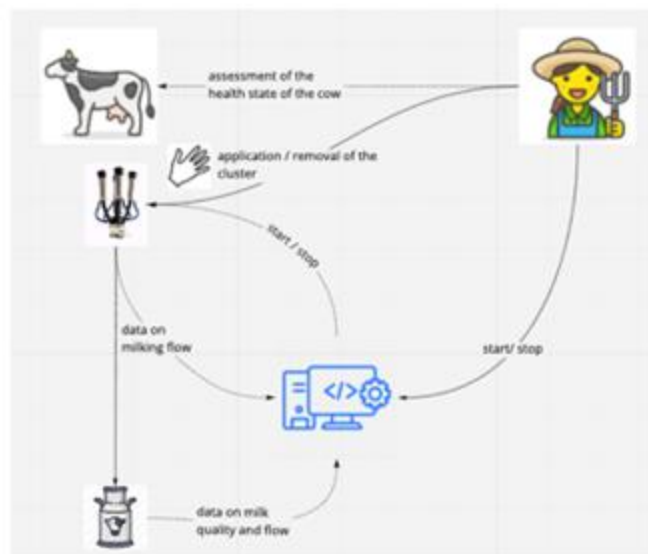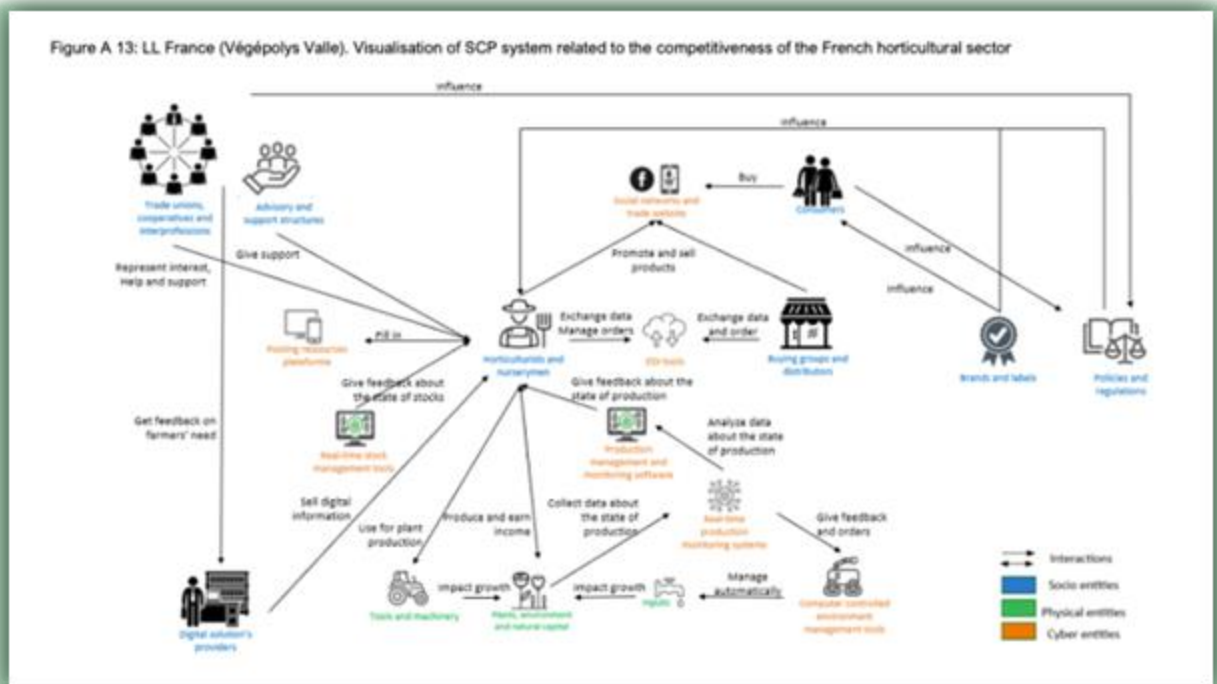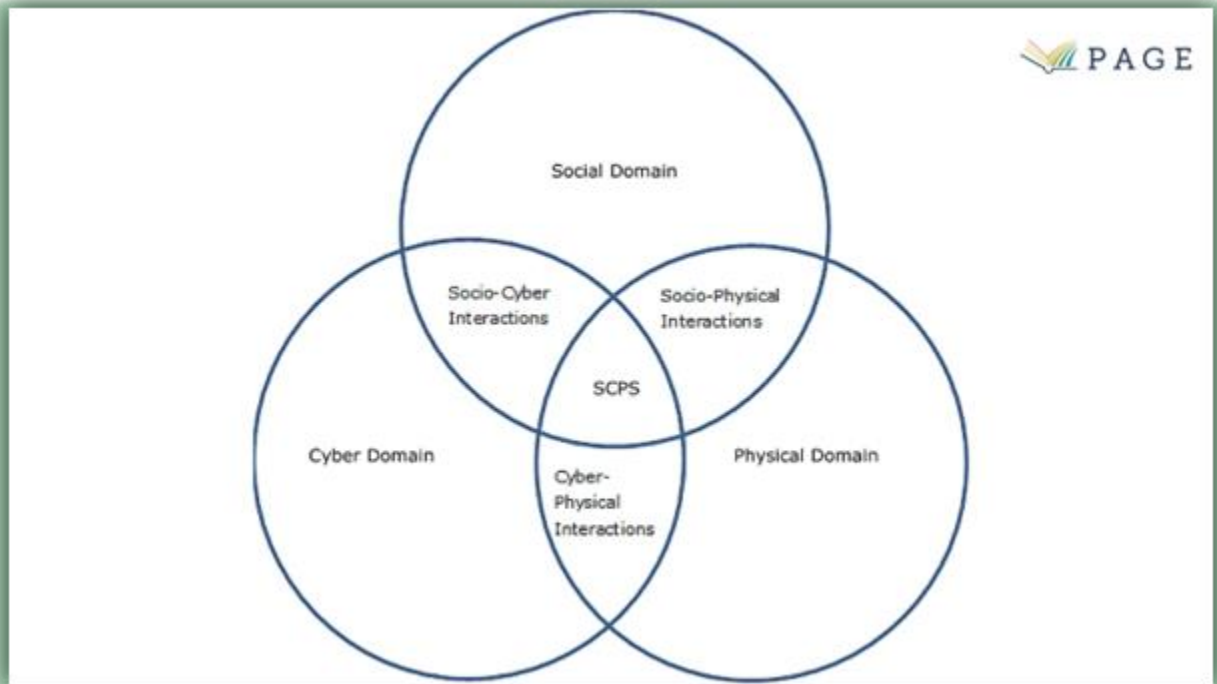
## Implications
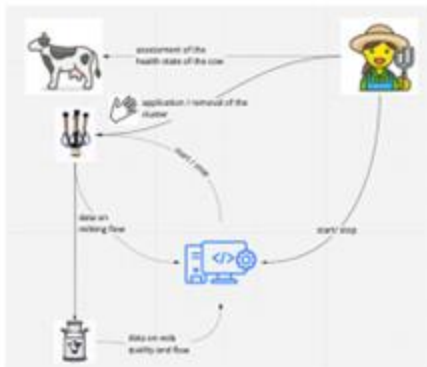
Who are the users?

Who are the designers?

Who are the beneficiaries?

Who are the victims?

Who are the regulators?

Who can influence?

The DESIRA project

- The impact of digitisation is affected by the conditions of the context in which it applies.
- Comprehensive assessment of opportunities and threats taking Sustainable Development Goals (SDGs) as points of reference.
- Political and ethical recommendation to rethink the relations among research processes and communities to reduce digital threats and to maximize public goods



How to prevent threats of innovation?

- How is possible to manage innovations, like the digitalization, avoiding social risks?
  - Anticipate failures
  - Take into account societal concerns
  - Identify necessary adaptations of the environment

Assessing the socio-economic impact of digitalisation in rural areas

## Design-related questions for a strategy

57



Socio-Cyber —> how to improve social interaction?

Cyber-physical —> how to reduce the pressure on resource systems?

Cyber-Cyber—> how to improve the efficiency and the effectiveness of data flows

## Design-related impact: risks

PAGE



FLAWS IN THE DESIGN (SAFETY, SYSTEMATIC BIAS, ERRORS)

EXTERNALITIES (ENVIRONMENTAL, HEALTH, ETHICAL)

OBSOLESCENCE

Access-related impact

PAGE

Physical access    Economic access    ICT literacy



The rural divide

PAGE

Figure 5 Fixed very high capacity network (VHCN) coverage (% of households) in the EU, 2013-2020

System-related impact

Information overload — Improper use of information — Congestion — Gaps in the ecosystem — Devices not compatible — Cybersecurity

Privacy violation — Power concentration
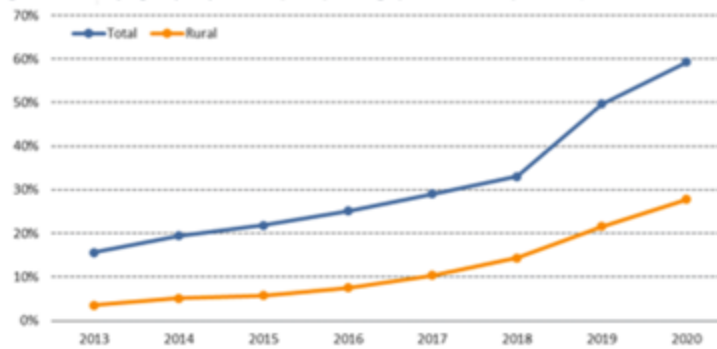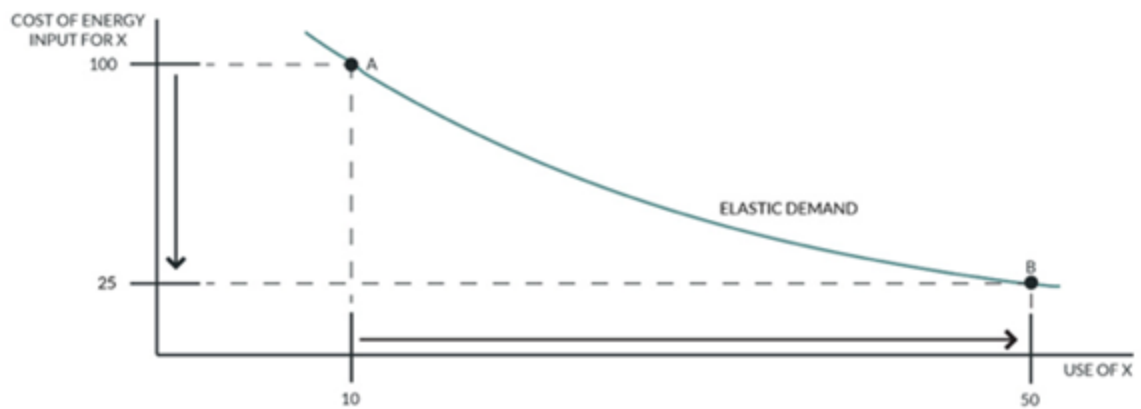


JEVONS PARADOX = "BACKFIRE"
EFFICIENCY IS COUNTERPRODUCTIVE
TO REDUCING CONSUMPTION

Systemic elements for a strategy

Interoperability

Digital ecosystems

Digital Governance



3. Systemic impact: example

PAGE

PM

GHG

Odour

Detecting emissions: Flanders



Information about emissions in a socio-cyber-physical system
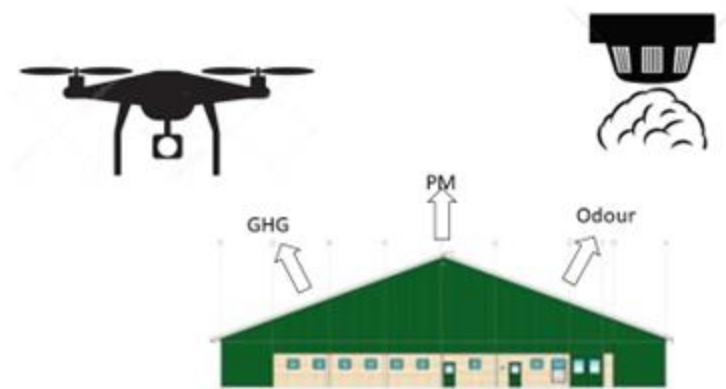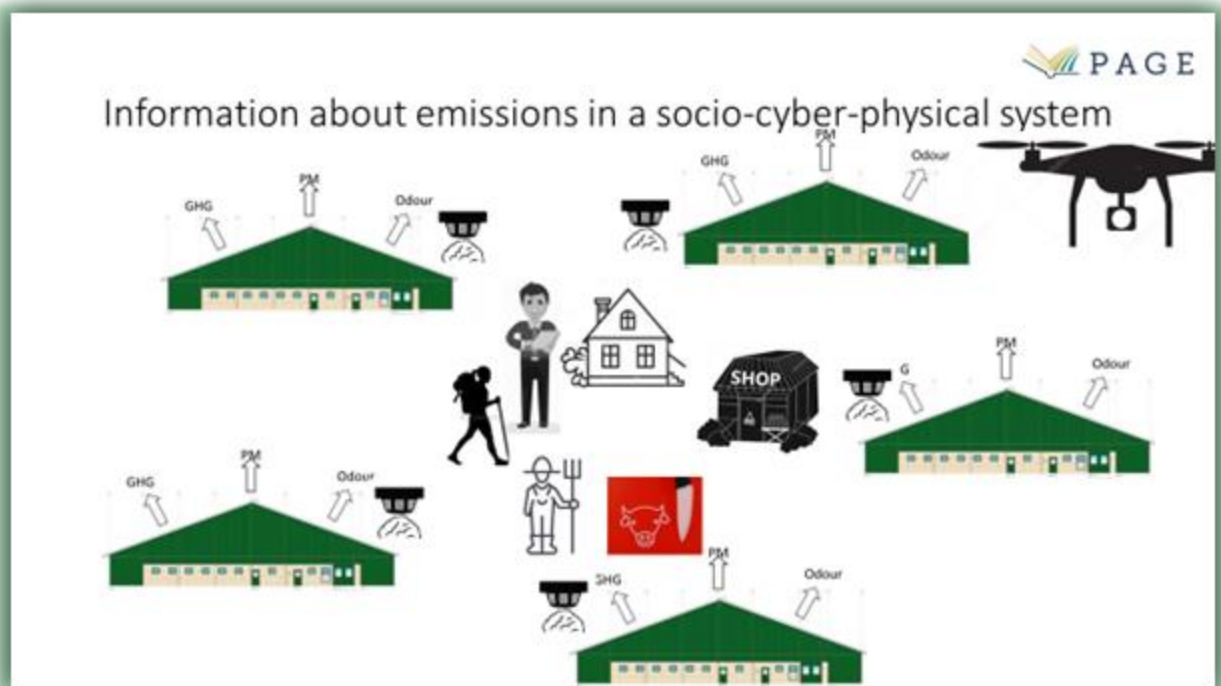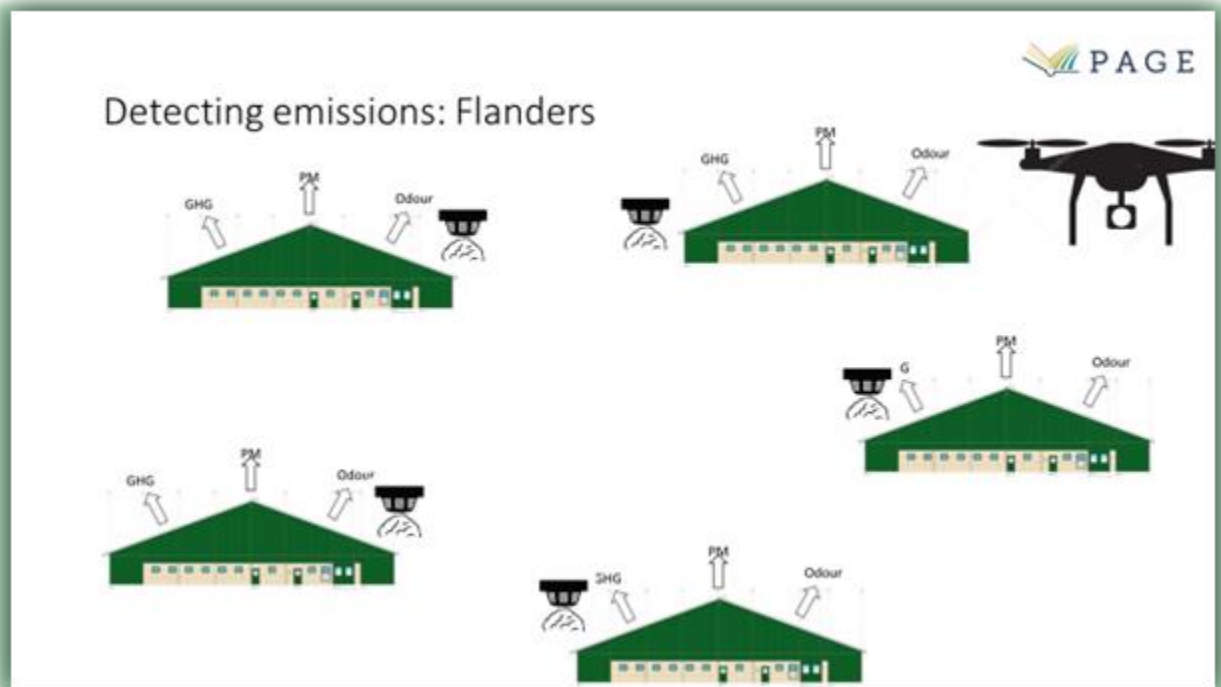
## The process of interacting innovation

PAGE
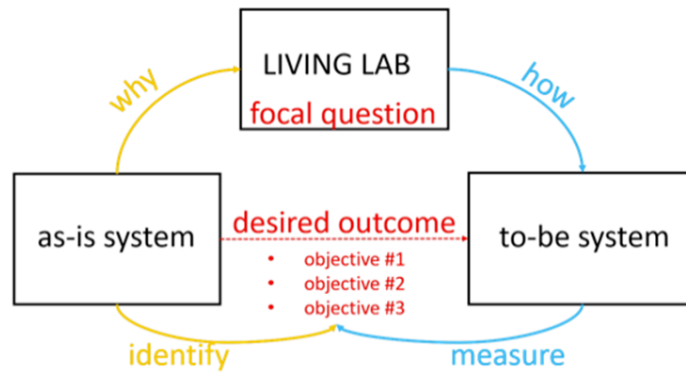


## Digital transformation in rural areas: elements for local strategies

PAGE

- Analysis of the socio-economic and socio-ecological context
- Analysis of the level of digitalisation of the area
- Needs and expectations of the area
  - social goals
  - economic goals
  - environmental goals
- Roadmap for a digital transformation
  - Digital transformation objectives related to Social goals
    - Relevant Application scenarios
      - Design
      - Access
      - System complexity
  - Digital transformation objectives related to Economic goals
    - Relevant Application scenarios
      - Design
      - Access
      - System complexity
  - Digital transformation objectives related to Enviromental goals
    - Relevant Application scenarios
      - Design
      - Access
      - System complexity

PAGE

## Working in groups

- Choose an 'application scenario' among the following ones:
  - Rural business
  - Rural life
  - Rural administration
- Analyse the socio-cyber-physical system before and after digitalization
  - Describe the process
  - Identify the relevant actors and their relations
  - Identify, among digital components, the 'game changers'
  - Analyse their impact on sustainability
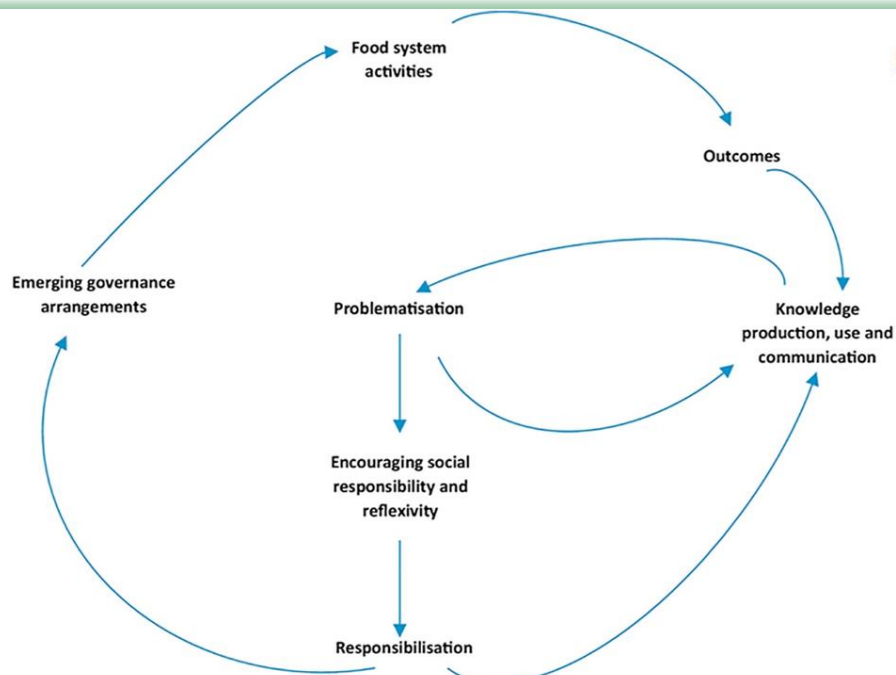
# Smart Villages: Policy Context

This training material aims to enhance your understanding of the socio-economic impact of digitalisation in rural areas. It covers a range of topics, including the policy context surrounding Smart Villages, the Rural Development Policy (2014-2020), and the priorities for supporting rural communities.

Rural Development Policy (2014-2020)

Assessing the socio-economic impact of digitalisation in rural areas — 4



Rural Development Policy (2014-2020)

Assessing the socio-economic impact of digitalisation in rural areas — 5

# Rural Development Policy (2014-2020)

**Priority 1: Knowledge Transfer and Innovation**
**FA 1A**: Fostering innovation, cooperation and the development of the knowledge base in rural areas;
**FA 1B**: Strengthening the links between agriculture, food production and forestry and research and innovation;
**FA 1C**: Fostering lifelong learning and vocational training in the agricultural and forestry sectors.

**Priority 2: Farm Viability and Competitiveness**
**FA 2A**: Improving the economic performance of all farms and facilitating farm restructuring and modernisation;
**FA 2B**: Facilitating the entry of adequately skilled farmers into the agricultural sector and generational renewal.

**Priority 3: Food Chain Organisation and Risk Management**
**FA 3A**: Improving competitiveness of primary producers by better integrating them into the agri-food chain;
**FA 3B**: Supporting farm risk prevention and management.

**Priority 4: Restoring, Preserving and Enhancing Ecosystems**
**FA 4A**: Restoring, preserving and enhancing biodiversity;
**FA 4B**: Improving water management;
**FA 4C**: Preventing soil erosion and improving soil management. .

**Priority 5: Resource-efficient, Climate-resilient Economy**
**FA 5A**: Increasing efficiency in water use by agriculture;
**FA 5B**: Increasing efficiency in energy use in agriculture and food processing;
**FA 5C**: Facilitating the supply and use of renewable sources of energy;
**FA 5D**: Reducing greenhouse gas and ammonia emissions from agriculture;
**FA 5E**: Fostering carbon conservation and sequestration in agriculture and forestry.

**Priority 6: Social Inclusion and Economic Development**
**FA 6A**: Facilitating diversification, creation and development of small enterprises, as well as job creation;
**FA 6B**: Fostering local development in rural areas;
**FA 6C**: Enhancing the accessibility, use and quality of information and communication technologies (ICT) in rural areas.

**150 Billion EUR**

Assessing the socio-economic impact of digitalisation in rural areas

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# Rural Development Policy (2014-2020)

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**150 Billion EUR**

Assessing the socio-economic impact of digitalisation in rural areas

7

Rural Development Policy (2014-2020)

What are the areas dealing with Digitalisation in the Rural Development Policy?

**Priority 1: Knowledge Transfer and Innovation**
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- Strong focus on infrastructure

Assessing the socio-economic impact of digitalisation in rural areas    10



Rural Development Policy (2014-2020)

What are the areas dealing with Digitalisation in the Rural Development Policy?

5.8% of rural population benefiting from improved ICT services

Most MS do not use the EAFRD to improve ICT infrastructure as they are too technical project for the competences of Ministries of agriculture.

Some rural communities take action to have ICT infrastructure

Assessing the socio-economic impact of digitalisation in rural areas    11

## Rural Development Policy (2014-2020)

What are the areas dealing with Digitalisation in the Rural Development Policy?

Figure 4. Next Generation Access coverage (percentage of households), 2017

■ Total  ■ Rural

EU average for rural areas

Source: IHS and Point Topic

5.8% of rural population benefiting from improved ICT services

Most MS do not use the EAFRD to improve ICT infrastructure as they are too technical project for the competences of Ministries of agriculture.

Some rural communities take action to have ICT infrastructure

Assessing the socio-economic impact of digitalisation in rural areas

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## Community Broadband – Kuhno (FI)
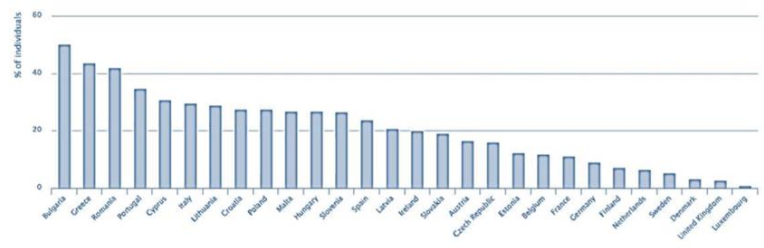


| Infrastructure | Length of network | Data speed | (Potential) subscribers |
|---|---|---|---|
| Fibre optic | 165 km | 100 Mbps to 1 Gbps Intranet data transfer speed | 200 households (74% of all households in 8 villages) |

| Financing | EUR |
|---|---|
| EAFRD | 627 372 |
| National co-finance | 766 788 |
| Private funding/loans: | 122 460 |
| Value of villagers' voluntary work | 367 380 |
| **Total** | **1 884 000** |

Assessing the socio-economic impact of digitalisation in rural areas

Digital use

What are the areas dealing with digitalisation in the Rural Development Policy?

Individuals who have never used the internet (in sparsely populated areas – 2016)

76% EU citizens NGA connected
**BUT only 40% in rural areas**

Source: ENRD, https://enrd.ec.europa.eu/publications/eu-rural-review-26-smart-villages-revitalising-rural-services_en .
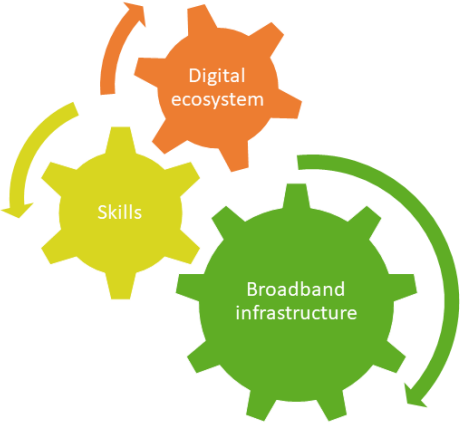
Assessing the socio-economic impact of digitalisation in rural areas

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Digitalisation of rural areas

Digital ecosystem

Skills

Broadband infrastructure

https://enrd.ec.europa.eu/sites/enrd/files/enrd_publications/smart-villages_orientations_digital-strategies.pdf
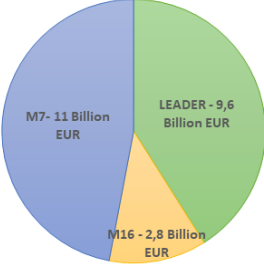
Assessing the socio-economic impact of digitalisation in rural areas

15

## RD measures to support digitalisation

- Cooperation
- Community-led local development
- Investments



LEADER - 9,6 Billion EUR

M7- 11 Billion EUR

M16 - 2,8 Billion EUR

- LEADER/CLLD (M19)
- Cooperation Measure (M.16), specially M16.7
- Basic services and village renewal (M.7), specially M7.1 - 7.4
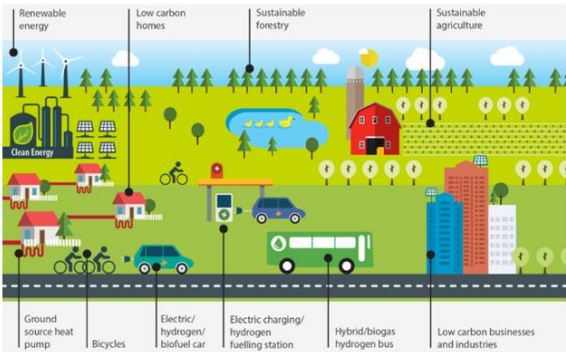
Assessing the socio-economic impact of digitalisation in rural areas

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## What it is being transformed in rural areas?

The ecosystem needs allow transformation of rural areas -> local uptake need



Source: ECOLISE. https://enrd.ec.europa.eu/sites/enrd/files/tl2_climate_challenges-and-territories_ecolise.pdf

Assessing the socio-economic impact of digitalisation in rural areas

## Question to all of you

**What are the main challenges and opportunities in the rural areas in your territory?**

*10 min discussion*

Assessing the socio-economic impact of digitalisation in rural areas

## Smart Villages - an inclusive definition



- "*Smart Villages are communities in rural areas that **use innovative solutions to improve their resilience, building on local strengths and opportunities.***

- They rely on a **participatory approach** to develop and implement their strategy to improve their economic, social and/or environmental conditions, in particular by mobilizing solutions offered by **digital technologies.**

- "**The use of digital technologies is not a precondition for becoming a Smart Villages**".

Pilot Project

http://www.pilotproject-smartvillages.eu/

Assessing the socio-economic impact of digitalisation in rural areas

Smart Villages

- Community-led
- Innovation
- Cooperation
- Rural transition

Assessing the socio-economic impact of digitalisation in rural areas



Lormes Villages of the future

Les villages du futur en Nivernais Morvan
Tentative de guide de « bonnes » pratiques pour les communes rurales

- Jobs
- Youth
- Housing
- Health
- Education
- Mobility
- **Connectivity**
- Culture
- And many more

Assessing the socio-economic impact of digitalisation in rural areas

## Rezo Pouce – shared mobility
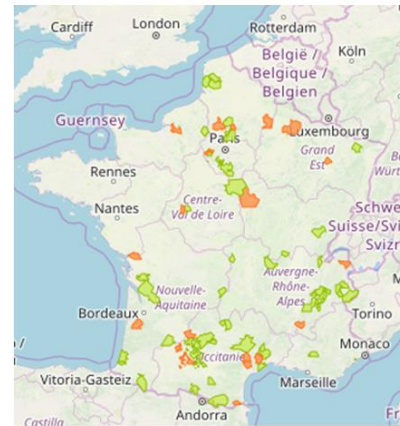


Assessing the socio-economic impact of digitalisation in rural areas

## Living Labs – German Digital Villages
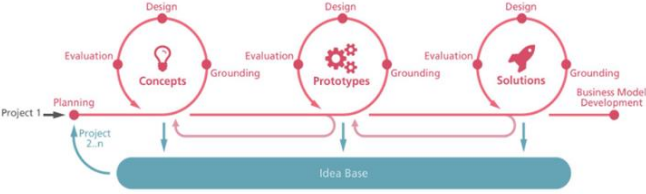


- Innovation within a smart rural ecosystem
- Develop cross-sectoral solutions
- Create a culture of collaboration between residents, local authorities and local industry:
- Build solutions that are sustainable
- Develop digital solutions that are affordable.

Source: ENRD. https://enrd.ec.europa.eu/sites/enrd/files/tg_smart-villages_case-study_de.pdf

Assessing the socio-economic impact of digitalisation in rural areas

## Living Labs – German Digital Villages

Source: ENRD. https://enrd.ec.europa.eu/sites/enrd/files/tg_smart-villages_case-study_de.pdf

**BestellBar**
The local online-marketplace

**LieferBar**

**BestellBar** and **LieferBar** were the first apps to be used, in 2016. After the first three months there were:
- 35 local vendors,
- 1 200+ available products
- 700+ registered residents
- 800+ items purchased
- 200+ voluntary deliveries

Assessing the socio-economic impact of digitalisation in rural areas

## Linking bottom up and top down



Assessing the socio-economic impact of digitalisation in rural areas

25

75

Digitalisation as means to an end
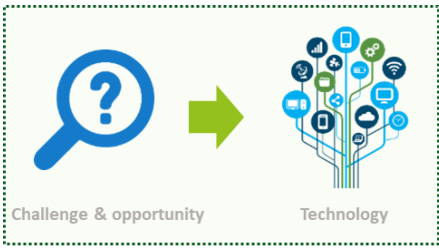
From technology as an end itself

To technology as the means to an end

FROM

Technology → Challenge & opportunity

TO

Challenge & opportunity → Technology

Assessing the socio-economic impact of digitalisation in rural areas

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Smart Villages

Smart Villages ≠ Individual Business modernisation

Assessing the socio-economic impact of digitalisation in rural areas

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## Question to all of you

**Do you see potential in Smart Villages in your country? What it would be the main challenges to implement it?**

*10 min discussion*

Assessing the socio-economic impact of digitalisation in rural areas

## How are SV supported by the RD policy in Europe?
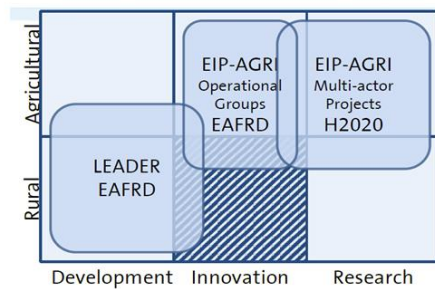


Source: Pertoldi, Muriel and Lopez (2016), page 5.

Pertoldi, M., Muriel, M., & Lopez, J. (2016). Smart LEADER: Challenging Smart specialization in the scope of rural development. Presentation at the conference on Smart Specialization and Territorial Development. Retrieved from https://3ftfah3bhjub3knerv1hneul-wpengine.netdna-ssl.com/wp-content/uploads/2018/07/Pertoldi_SmarLEADER_final.pdf . (Retrieved in January 2019).

Assessing the socio-economic impact of digitalisation in rural areas

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## How are SV supported by the RD policy in Europe?

Preparatory support

Cooperation

Investment

Innovation brokerage

https://enrd.ec.europa.eu/smart-and-competitive-rural-areas/smart-villages/smart-villages-portal/smart-villages-toolkit_en

Assessing the socio-economic impact of digitalisation in rural areas

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## Rural Development Policy (2021-2027)

Commons Agricultural Policy

Pillar 1

**Pillar 2**
(European Agricultural Fund for Rural Development)

*27 Programmes (UK out)*

*New policy framework*

Assessing the socio-economic impact of digitalisation in rural areas

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# Smart Villages and EU Green Deal



https://enrd.ec.europa.eu/sites/enrd/files/enrd_publications/tg6_smart-villages_sv-green-deal-bill-slee.pdf

Assessing the socio-economic impact of digitalisation in rural areas

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# How to improve the capacity to respond to the challenges and opportunities of the digitalisation in rural areas

This training material provides insights on how to improve the capacity to respond to the challenges and opportunities of digitalisation in rural areas and focuses on assessing the socio-economic challenges of digitalisation in rural areas. The material covers topics such as societal concerns related to digitalisation, challenges faced by rural areas in adopting digital technologies, and strategies for designing technology that meets user needs and addresses societal challenges.



How to improve the capacity to respond to the challenges and opportunities of the digitalization in rural areas?

Gianluca Brunori (University of Pisa)

15 November 2021

Sant'Anna Winter School

Under which conditions do digital technologies become game changers?



Digitalisation as a socio-technical process

Assessing the socio-economic impact of digitalisation in rural areas

A sustainable digitalisation

Improve the **capacity of society and political bodies** to respond to the challenges of digitalisation in rural areas, agriculture and forestry



# Uptake of societal concerns

technology as an end itself

technology as the means to an end

FROM Technology → Challenge & opportunities

TO Challenge → Technology

Assessing the socio-economic impact of digitalisation in rural areas 5

## DESIRA Living Labs



PAGE

1. **Oosterwold (NL)**
Local markets
2. **Central Ostrobothnia (FI)**
Circular economy
3. **Rhineland-Palatinate (DE)**
Communication and gender
4. **Rural Poland (PL)**
Participation
5. **Latvia (LV)**
Digital marketing

6. **Lake Constance (DE)**
Organic fuit production
7. **Austria (AT)**
Wood traceability
8. **North Great Plain (HU)**
SMEs in rural areas
9. **Switzerland (CH)**
Organic farming
10. **Northern Greece (GR)**
Smart rural communities

11. **Trikala (GR)**
Water management
12. **Adriatic Region (HR)**
Tourism
13. **Apennine Region (IT)**
Firewood traceability
14. **Tuscany (IT)**
Land management
15. **Andalucia (ES)**
Forest fires
16. **Aragon (ES)**
Rural attractiveness

17. **New Aquitaine (FR)**
Digital wine sector
18. **Burgundy-Franche-Comté (FR)**
Agroecological transition
19. **Scotland (GB)**
SMEs in rural areas
20. **West Flanders (BE)**
Livestock production

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## The challenges of digitalisation

PAGE

**Design-related conditions**

**Access-related conditions**

**System-related conditions**

## The challenges of digitalisation

**Design-related conditions**

Access-related conditions

System-related conditions

How can technology design meet the needs and expectations
of users and address societal challenges?

---

## Assessing digitalisation: Living Labs



To-be system
• Use cases

Focal question

Scenario assessment
• Plausible/ desirable futures

Needs and expectations

As-is system
• Assessment of the current scps

9
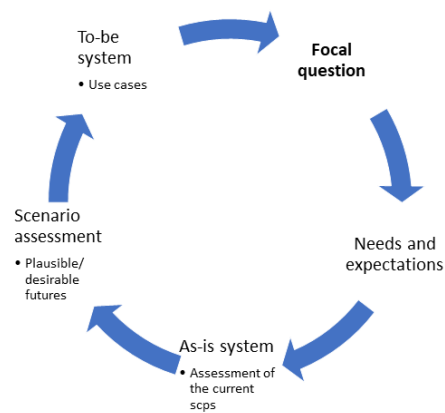
Design-related conditions: the DESIRA toolkit
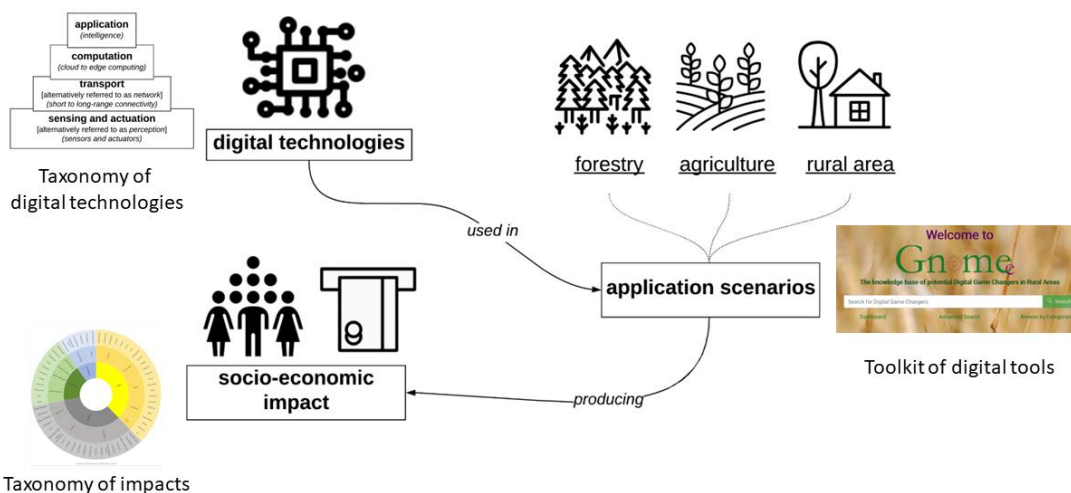


| Living Labs | | Focal questions |
|---|---|---|
| 1. | Austria | How can digitalisation support and enforce the adoption of the European Timber Regulation (EUTR) concerning imported round wood in Austria? |
| 2. | West Flanders, Belgium | What is the impact of individual farm based airborne monitoring of emissions of ammonia, particulate matter, and odour, in the intensive livestock sector for agriculture, policy, and society in Flanders? |
| 3. | Switzerland | How to control weeds effectively and efficiently in Swiss organic vegetable farming? |
| 4. | Lake of Constance, Germany | How can digitalisation contribute to the sustainability of fruit production in the Lake of Constance region? |
| 5. | Rhineland-Palatinate, Germany | How the local administration can cope with internal and external challenges of the digital transformation and integrate citizens as well as other local actors into this process? |
| 6. | Greece | How to develop new digital services and functionalities for rural communities based on utilization of existing agricultural / data infrastructures and tools. How can these infrastructures be used to further support the economy and farmers' / citizens' income in rural communities?' |
| 7. | Trikala, Greece | How to better manage water resources for the benefit of both, farming purposes and the everyday needs of the citizens? |
| 8. | Andalucia, Spain | How can digitalisation contribute to reduce the damage caused by wildfires and to make more effective firefighting and degraded land restoration by 2030? |

PAGE

**Application scenarios: Rural life**



PAGE

**Application Scenarios: Rural business**

Appllication scenario: Rural administration
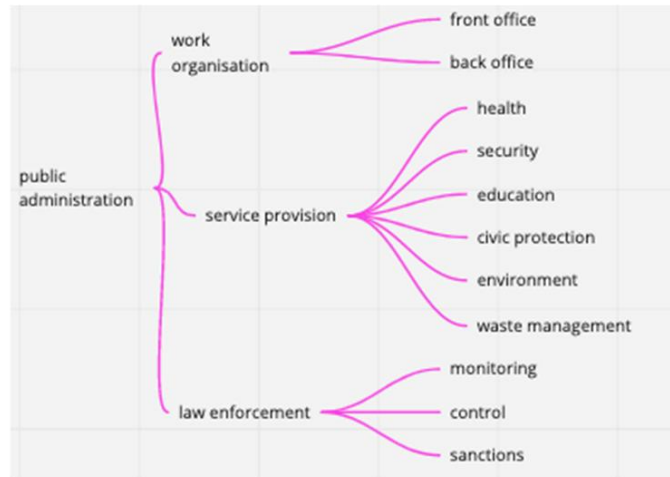


Needs



ACCESS TO INFORMATION · SKILLS · CONNECTIVITY · DATA AVAILABILITY · DATA SECURITY

DIGITAL SERVICES · INTEROPERABILITY

## Digital Technologies: A Look at the Past

**How have digital technologies been used in the last ten years (2011-2021) in the ordinary management of the territory in the mountain areas of the Consorzio Toscana Nord?**

In the report developed by DESIRA following the more than 10 individual interviews carried out last autumn and the workshop on January 18th we identified 4 functions in the use of digital technologies in the last 10 years:

- Monitoraggio del territorio
- Comunicazione con attori del territorio
- Raccolta e gestione dei dati
- Progettazione degli interventi

## Digital Technologies: A Look at the Past

**Function: Territory Monitoring**

CAPANNINE METEO

PLUVIOMETRI

AGRICOLTORI CUSTODI

SENSORI PLUVIOMETRICI

WEBCAM

PORTALE SIR. T.

DRONI

2010    2012    2014    2016    2018    2020    Oggi

Digital Technologies: A Look at the Past

Function: Communication



Digital Technologies: A Look at the Past

Function: Collect and manage data
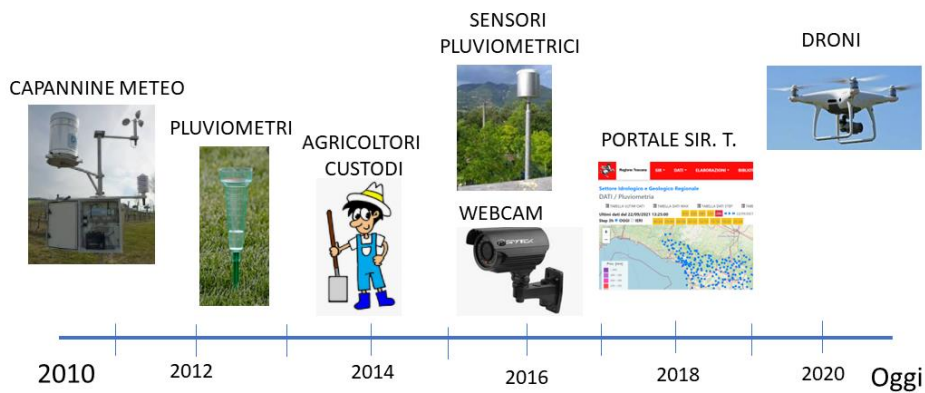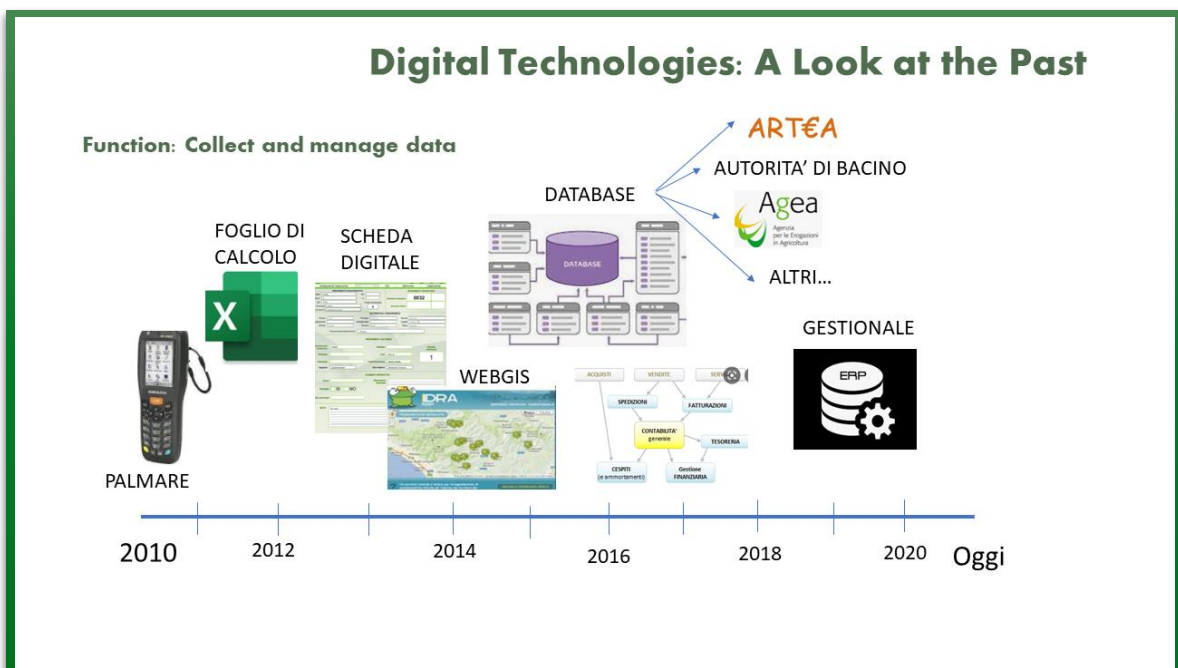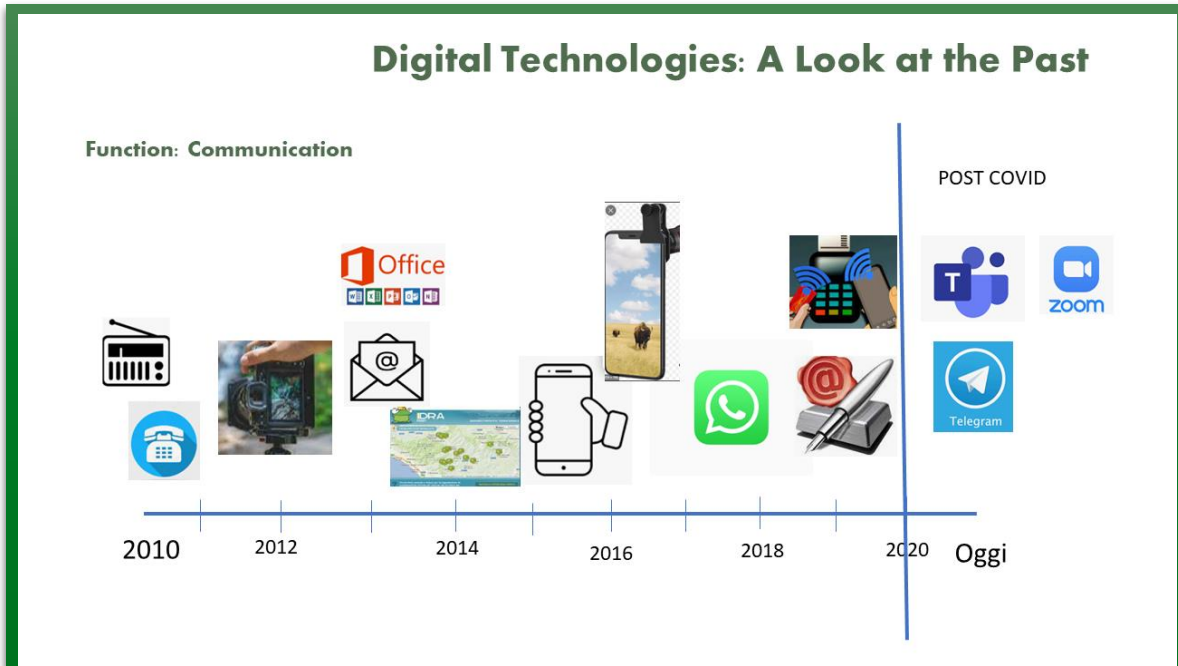
**Digital Technologies: A Look at the Past**

Function: Planning of interventions

IDRAMAP

2010    2012    2014    2016    2018    2020    Oggi
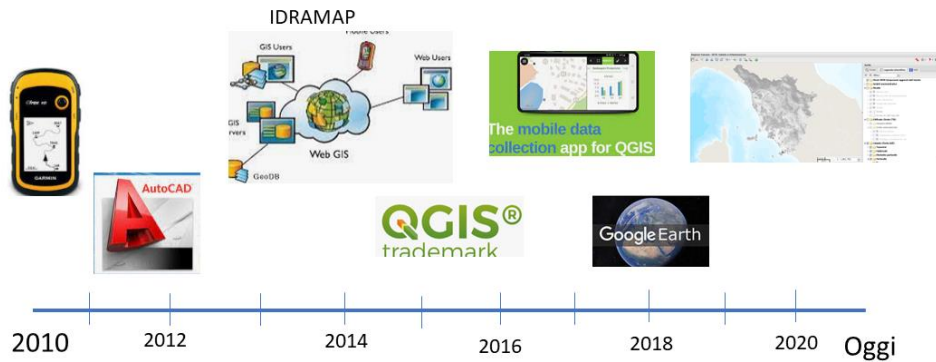


Foresight exercise: two scenarios

How will the management of the territory be structured in the mountain areas of the Consorzio Toscana Nord in 2031? What role will digital technologies play?

Oggi    2023    2025    2027    2029    **2031**
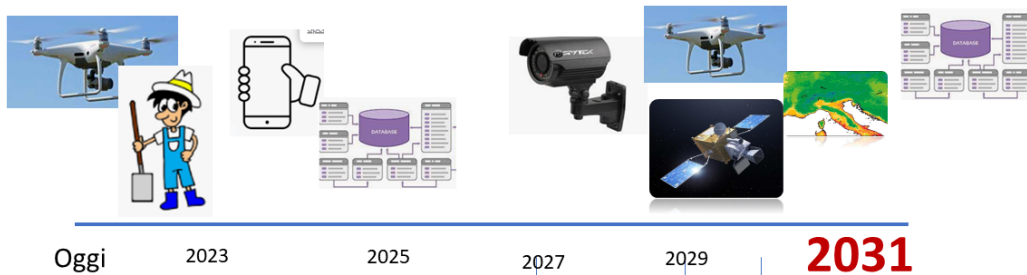
**Scenario 1: Use of digital technologies to integrate the participation of farmers/citizens in land monitoring with a system of local and remote sensors**

**Scenario 2: Exclusive use of sensors and drones for monitoring, without involving citizens and farmers**

PAGE

The challenges of digitalisation

Design-related conditions

Access-related conditions

System-related conditions

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PAGE

The level of digitalisation: the DESI index

Figure 8 Digital Economy and Society Index, 2021

■ 1 Human capital    ■ 2 Connectivity    ■ 3 Integration of digital technology    ■ 4 Digital public services
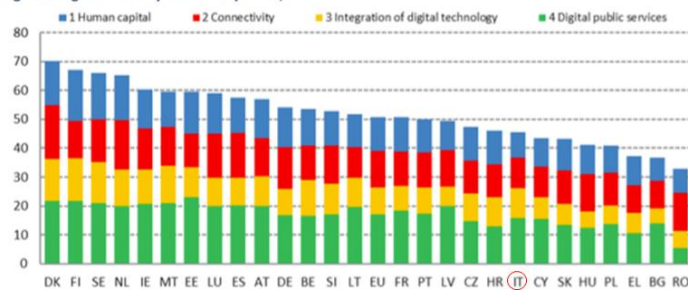
Source: DESI 2021, European Commission.

## The components of the DESI index

**Table 1 Structure of DESI 2021**

| | |
|---|---|
| 1 Human capital[24] | Internet user skills and advanced digital skills |
| 2 Connectivity[25] | Fixed broadband take-up, fixed broadband coverage, mobile broadband and broadband prices |
| 3 Integration of digital technology[26] | Business digitalisation and e-commerce |
| 4 Digital public services[27] | e-Government |

*Source: European Commission*

---

**Table 2.** Human capital dimension

| Indicator | Description | Unit | Source |
|---|---|---|---|
| 1a1 At least basic digital skills | Individuals with 'basic' or 'above basic' digital skills in each of the following four dimensions: information, communication, problem solving and software for content creation (as measured by the number of activities carried out during the previous 3 months). | % individuals | Eurostat - European Union survey on ICT usage in Households and by Individuals |
| 1a2 Above basic digital skills | Individuals with 'above basic' digital skills in each of the following four dimensions: information, communication, problem solving and software for content creation (as measured by the number of activities carried out during the previous 3 months). | % individuals | Eurostat - European Union survey on ICT usage in Households and by Individuals |
| 1a3 At least basic software skills | Individuals who, in addition to having used basic software features such as word processing, have used advanced spreadsheet functions, created a presentation or document integrating text, pictures and tables or charts, or written code in a programming language. | % individuals | Eurostat - European Union survey on ICT usage in Households and by Individuals |
| 1b1 ICT specialists | Employed ICT specialists. Broad definition based on the ISCO-08 classification and including jobs like ICT service managers, ICT professionals, ICT technicians, ICT installers and servicers. | % individuals in employment aged 15-74 | Eurostat - Labour force survey (isoc_sks_itspt) |
| 1b2 Female ICT specialists | Employed female ICT specialists. Broad definition based on the ISCO-08 classification and including jobs like ICT service managers, ICT professionals, ICT technicians, ICT installers and servicers. | % ICT specialists | Eurostat - Labour force survey (isoc_sks_itsps) |
| 1b3 Enterprises providing ICT training | Enterprises who provided training in ICT to their personnel | % enterprises | Eurostat - European Union survey on ICT usage and eCommerce in Enterprises (E_ITT2) |
| 1b4 ICT graduates | Individuals with a degree in ICT | % graduates | Eurostat (table educ_uoe_grad03, using selection ISCED11=ED5-8) and and ISCEDF_13 [F06] Information and Communication Technologies |

PAGE

Table 3 Human capital indicators in DESI

| | EU | |
|---|---|---|
| | DESI 2019 | DESI 2021 |
| **1a1 At least basic digital skills** % individuals | 55% 2017 | 56% 2019 |
| **1a2 Above basic digital skills** % individuals | 29% 2017 | 31% 2019 |
| **1a3 At least basic software skills** % individuals | 58% 2017 | 58% 2019 |
| **1b1 ICT specialists** % individuals in employment aged 15-74 | 3.8% 2018 | 4.3% 2020 |
| **1b2 Female ICT specialists** % ICT specialists | 17% 2018 | 19% 2020 |
| **1b3 Enterprises providing ICT training** % enterprises | 22% 2018 | 20% 2020 |
| **1b4 ICT graduates** % graduates | NA 2016 | 3.8% 2018 |

*Source: DESI 2021, European Commission.*

PAGE

Figure 3 Digital skills (% of individuals), 2015-2019[28]
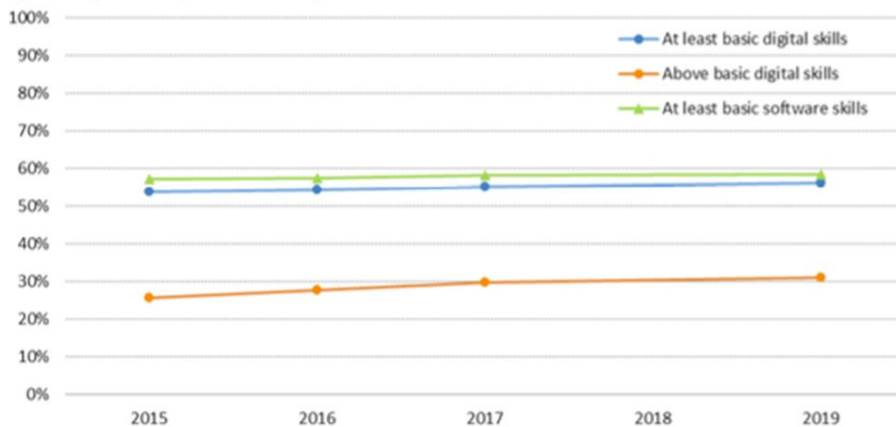


*Source: Eurostat, European Union survey on the use of ICT in Households and by Individuals*

The challenges of digitalisation

Design-related conditions

Access-related conditions

## System-related conditions



Source: own elaboration

**7 GUIDING PRINCIPLES FOR SUSTAINABLE DIGITALISATION IN RURAL AREAS IN 2040**

Creating the basic conditions for digitalisation

Anchoring digitalisation to sustainable development

Adapting digitalisation to different contexts

Favouring digital inclusion

Developing digital ecosystems

Developing adaptive governance models

Designing policy tools for sustainable digitalisation



PAGE
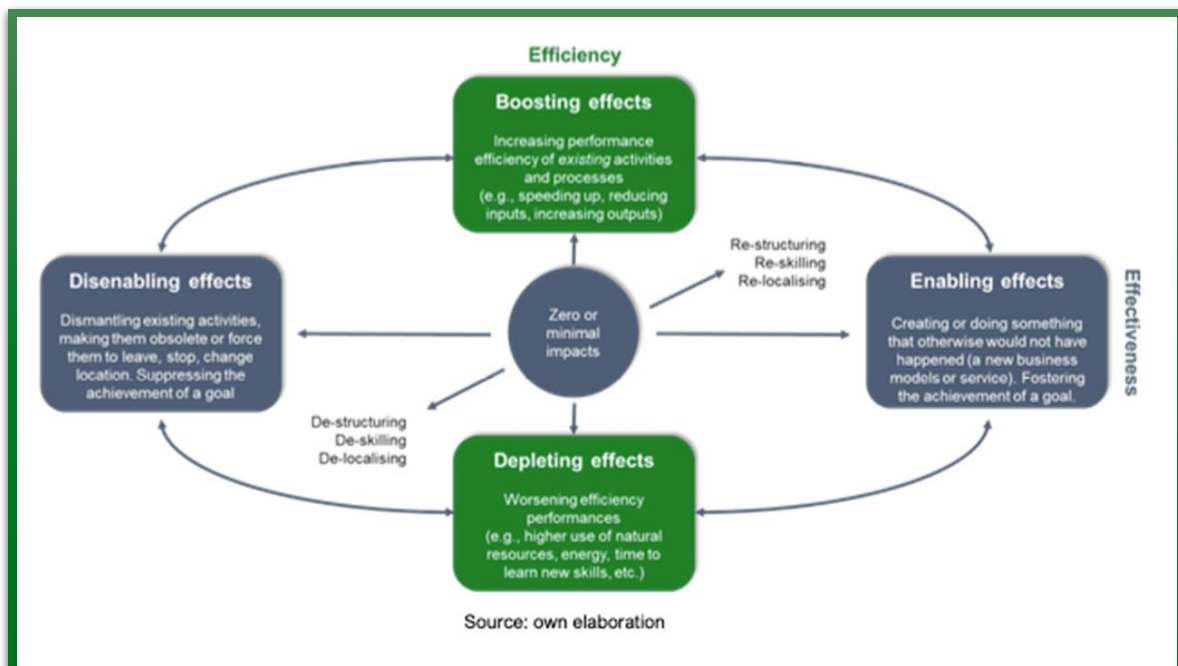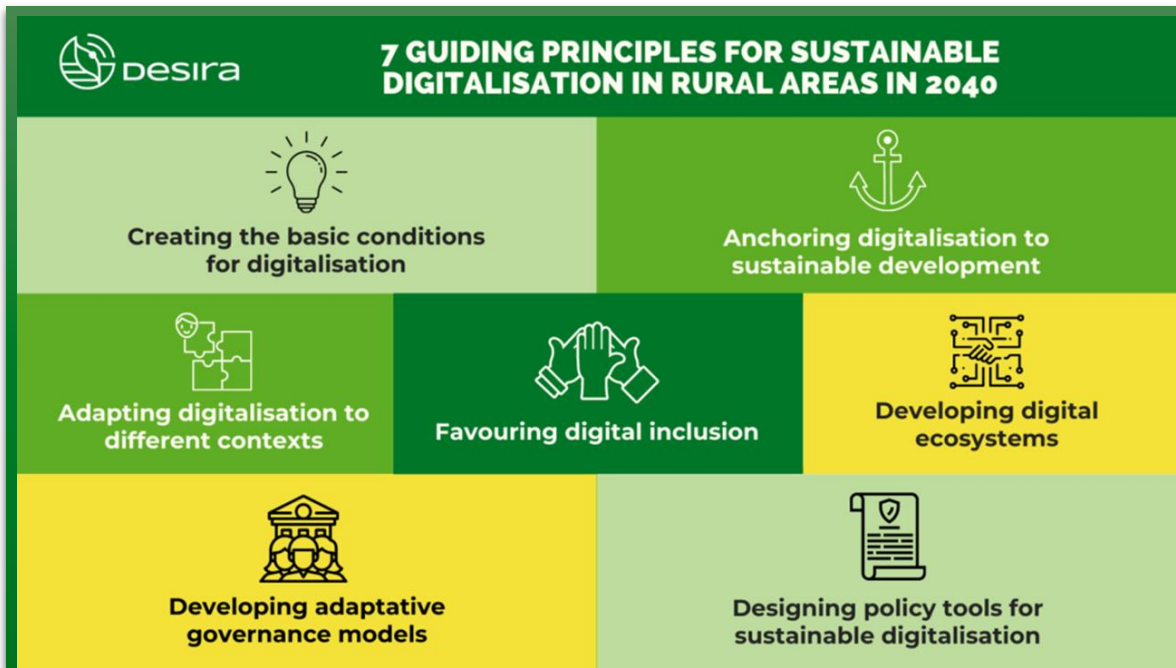
## 1. Creating the basic conditions for digitalisation

Table 2 Digital Compass targets in DESI 2021 in relation to the four dimensions of the index

| 1 Human capital | At least basic digital skills |
| | ICT specialists |
| | Female ICT specialists |
| 2 Connectivity | Gigabit for everyone (Fixed very high capacity network coverage) |
| | 5G coverage |
| 3 Integration of digital technology | SMEs with a basic level of digital intensity |
| | AI |
| | Cloud |
| | Big data |
| 4 Digital public services | Digital public services for citizens |
| | Digital public services for businesses |

Source: European Commission

## 2. Anchoring digitalisation to sustainable development

Increasing the area managed with precision farming

**technology as an end itself**

Increasing the area managed with agroecological practices through digital technologies

**technology as the means to an end**

FROM

Technology → Challenge & opportunities

TO

Challenge → Technology

AGE

---

**pre-digital**
limited use of mass digital tools because of poor / no broadband connection or poor value

**early digital**
use of mass digital tools and local systems for simple administration

**digital**
increased productivity / reduced costs thanks to simple connected monitoring systems

**digital+**
use of smart machinery and monitoring systems for farm management in an integrated manner

**innovator**
efficient use of big data to take decisions, improve the position in the market, efficiently manage the farm

3. Adapting digitalisation to different contexts: digital readiness

PAGE

3. Adapting digitalisation to different contexts: Scaling readiness



PAGE

4. Favouring digital inclusion

## 5. Developing digital ecosystems

🏢 Infrastructures

👥 Skilled users

👤 Technology developers

🧠 Services

📊 Data

📶 Interoperability

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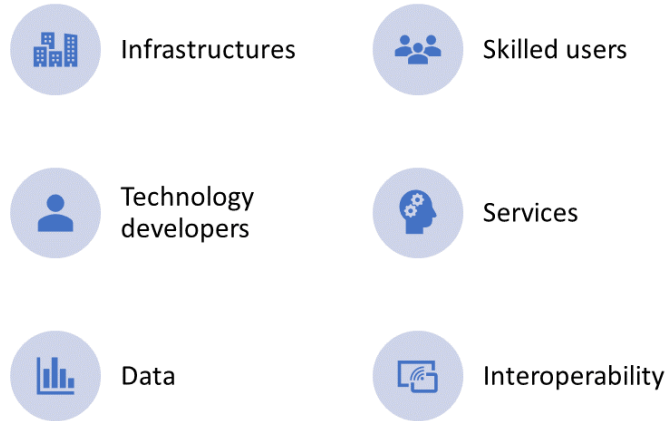
**Digital ecosystems: three levels**
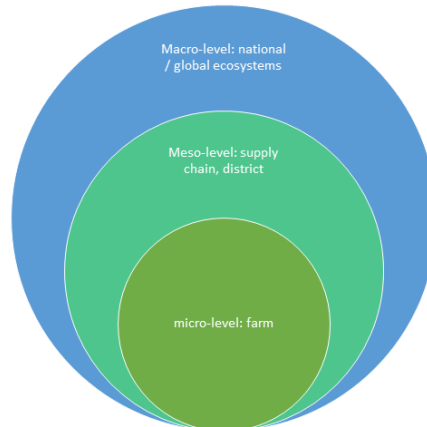
Macro-level: national / global ecosystems

Meso-level: supply chain, district

micro-level: farm

Figure A 13: LL France (Végépolys Valle). Visualisation of SCP system related to the competitiveness of the French horticultural sector
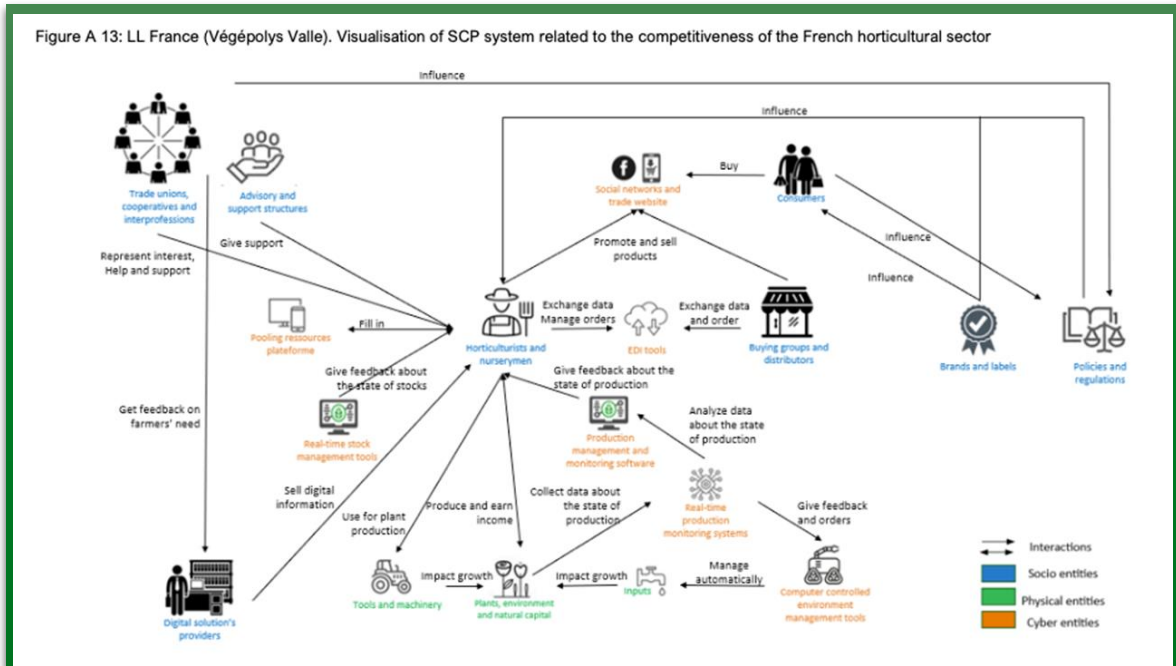


**Figure 1**: Stylized Food System in the Digital Era
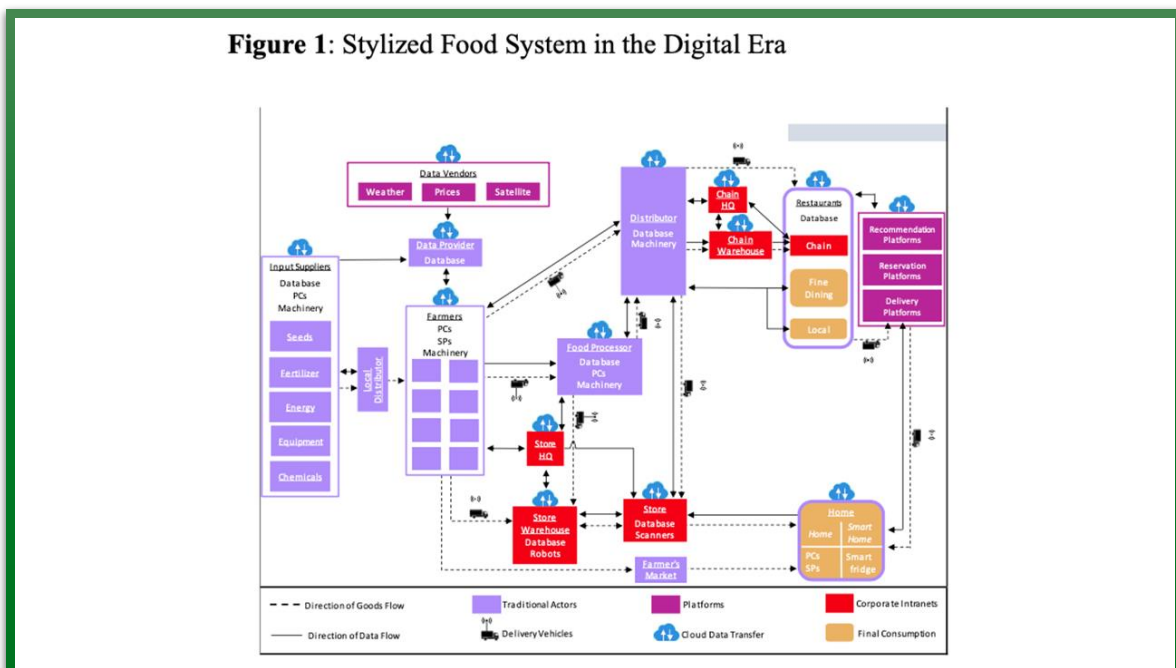
**Figure 3 Estimated Amount of Data Generated by the Average Connected Farm per Day**



Estimated Amount of Data Generated by the Average Farm Per Day

Source: Meola 2016

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PAGE
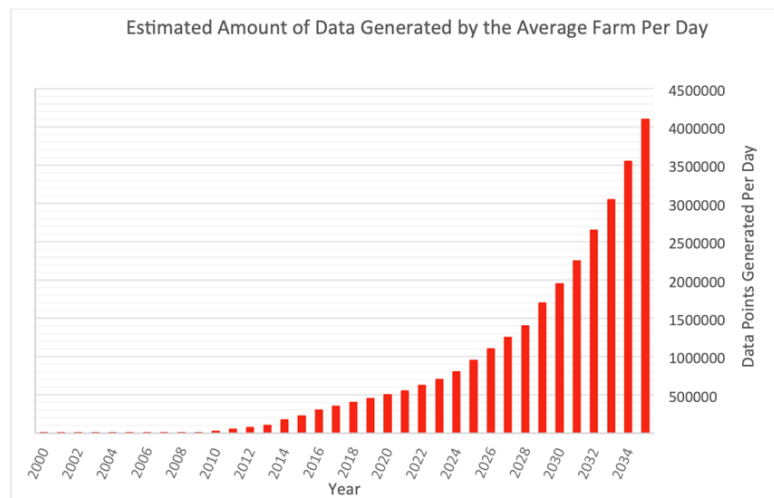
## Data-related issues

- Who 'owns' the data?
- Who the data may be shared with?
- Where the data may be stored (including in which country)?
- What are indemnities and liabilities in relation to the data?
- Can the data be migrated or transferred from one vendor to another?
- How to ensure a fair distribution of benefits related to data?
- How to prevent monopolies?

Weather Information Apps • Commodity Price Apps • Remote Sensing Apps • Farm Management Apps • Buyers

Farm Machinery • Seeds • Chemicals → Platform

Commodity Traders • Insurance Firms • Advertisers • Bankers • Food Processors

Focal Farmer (from machines, sensors, production, etc.) • Other Farmers (from machines, sensors, production, etc.)

Two-way flow ←→
Purchased data – →
Sold data ·····►
Input specs — · — ►

## Platforms

- An online digital platform is a "site" composed of software that enables multi-sided interaction among independent parties
- Platforms are intermediaries between independent parties, which are often called the "sides" of the market or platform
- They are not just technical systems or neutral arbiters; they are also governance structures
- If a digital platform is designed properly, it can attract complementors to form an ecosystem of organizations that operate through and create value for the platform and its users
- Successful platforms grow by attracting users and service providers, thereby initiating network effects
- As an intermediary, the platform has a panoptic view of all activity on it. The key to the power of a platform is its ability to "tax" ecosystem participants for using it
- Successful for-profit platforms are monopolists aiming to extract as much value as possible from those transacting through it, limited only by their need to prevent the complementors from abandoning the platform

6. Developing adaptive governance models
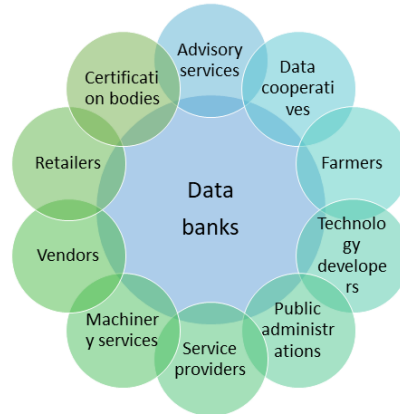


7. Designing policy tools for sustainable digitalisation

Monitoring digitalisation trends

Combating the digital divide

Planning training programmes

Entry level digitalisation schemes

- Digital fertilization plans
- Farm digital registers
- Digital certification

Interactive innovation
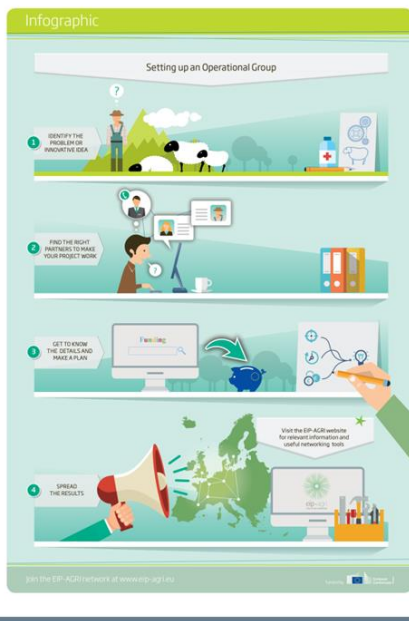
## 4. Policy tools: operational groups

Digital innovation implies an assemblage of different technologies and test on the field.
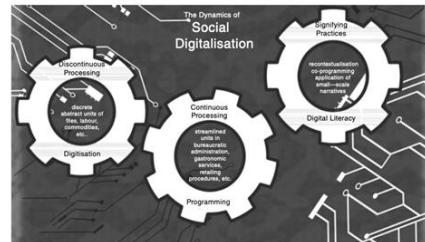


Fig. 1.1 Three strands of social digitalisation
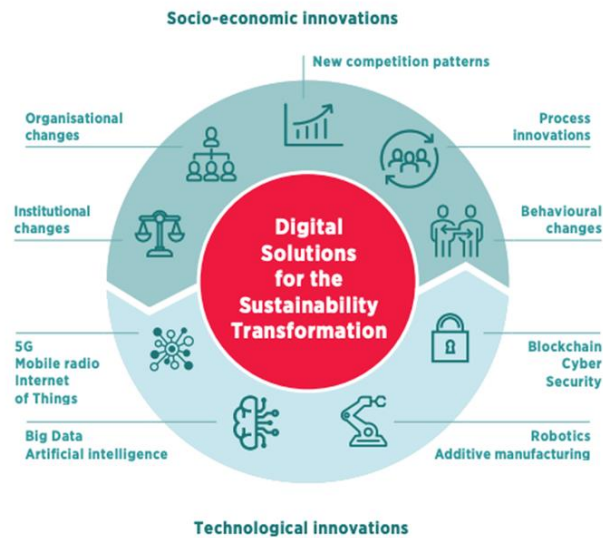
**7 GUIDING PRINCIPLES FOR**

**SUSTAINABLE DIGITALISATION**

IN RURAL AREAS BY 2040

**Creating the basic conditions for digitalisation**
Infrastructure, human capital, and economic gains remaining in local communities. Rural areas must have access to intermediaries, digitalisation brokers and 'spaces' to support digitalisation.

**Anchoring digitalisation to sustainable development**
Digitalisation can be a driver of sustainable development, provided that digitalisation processes and strategies are aligned with Sustainable Development Goals (SDGs).

**Adapting digitalisation to different contexts**
Many of the issues addressed in the discussion about digitalisation are multi-factorial, and need to be considered from a multi-level and multi-actor perspective.

**Favouring digital inclusion**
Even in a level playing field, digitalisation can generate uneven development. To prevent marginalisation and polarisation, active policies should be put in place to avoid digital exclusion and to ensure that no one is left behind.

**Developing digital ecosystems**
The contribution of digitalisation to development depends on the integration of actors, infrastructures, digital application systems, data and services. Gaps in one of these aspects may hamper the success of digitalisation strategies.

**Developing adaptative governance models**
Governance models will need to shift from reactive to proactive models.

**Designing policy tools for sustainable digitalisation**
The whole set of policies that affect rural areas, agriculture and forestry should be revised and designed in the light of the opportunities and of the threats that digitalisation poses to them.

## In agriculture

- Satellites —> land, climate
- Sensors —> position, humidity, temperature, contaminants
- Drones —> data collection, on spot operations
- Unmanned vehicles , robots—> labour productivity
- Internet of things —> automation
- Social networks —> social capital, access to information
- Remote communication → coordination
- Virtual and augmented reality → increasing peoples' capacities

PAGE

Impact pathway
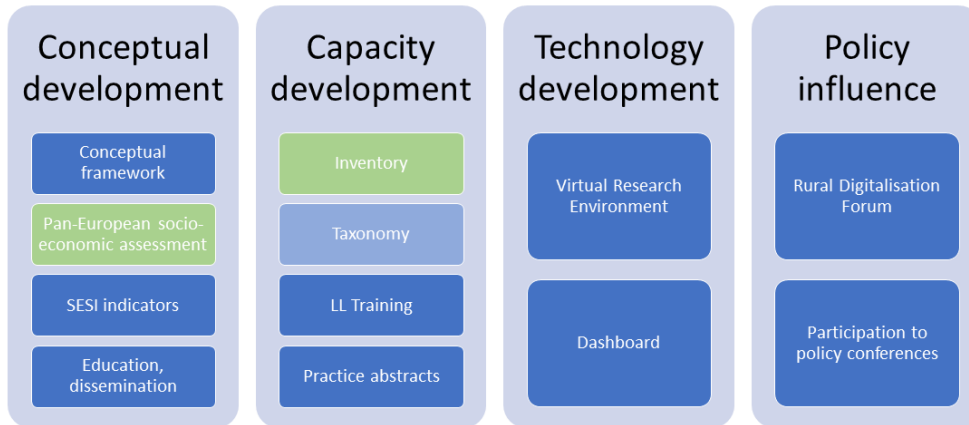


Socio-cyber-physical systems
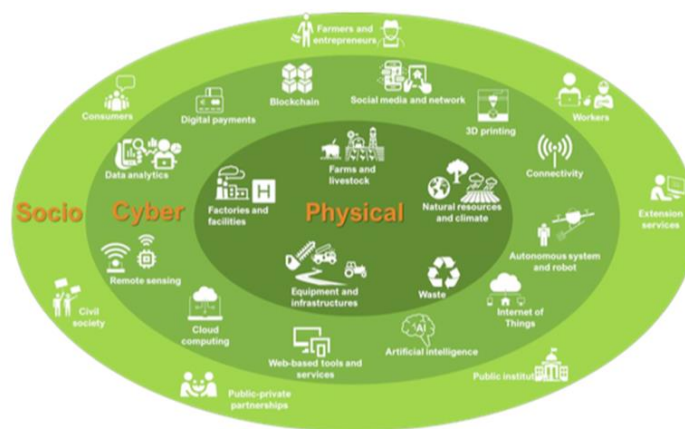
Source: own elaboration based on the 21 Living Labs' reports

# The ecological transition and the potentials of digitalisation

This training material debates the challenges and potentials of digitalisation and the different approaches towards digitalisation. It also approaches the idea of Responsible Research and Innovation (RRI) and the potentials of digitalisation.

## Planetary Boundaries

**The Donut Economy**

## Transition approaches

- Resistance to change is embedded into 'regimes', rules and routines that ensure the stability of the system
- The regime controls behavior of individuals and organization indirectly: knowledge paradigms, technical and ethical norms, infrastructures, etc..
- Transition implies a change of regime, and this will create resistance and implies costs
- Resources for change are found in 'niches', practices and routines that work already with rules conflicting with the regime

PAGE

## How is a safe operating space defined?

| Planetary boundary / Indicator | Target number for 2050 |
|---|---|
| Climate change / $CO_2$ emission | Reduce $CO_2$ by 84 % in 2050 |
| Biosphere integrity / Species number | Restore declining biodiversity and their ecosystems. Reach the 2000 level |
| Land system change / eHANPP | Reduce eHANPP by 15 % in 2050 |
| Freshwater use / Blue water | Keep freshwater use at recent level |
| Biogeochemical flows / Nitrogen and Phosphorus applications | Reduce N by 86 % in 2050 Reduce P by 81 % in 2050 |
| Novel entities and chemical pollutions / Pesticide applications | Reducing pesticides by 75% in 2030 |

PAGE

## How is a just operating space defined?

- Healthy and sustainable nutrition for all
- No gender discrimination
- Fair remuneration of farmers' work
- All farm animals treated according to stringent welfare standards
- Access to Internet for all in rural areas

PAGE

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PAGE

## Transition: One goal, three pathways



circularity

nutrition

Safe and just
operating space
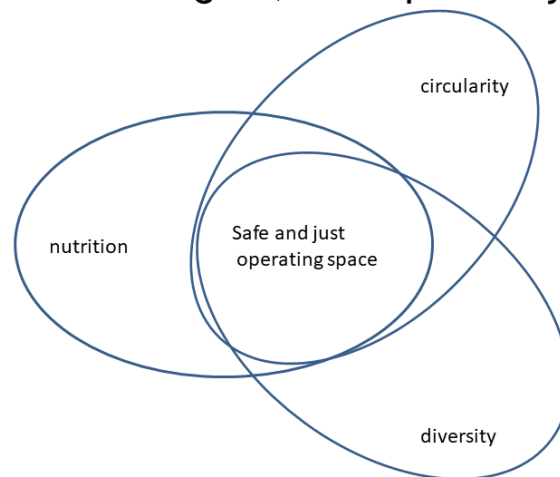
diversity

# Transition 1: Sustainable diets for all

**SDGs**

Food security,
Responsible production and consumption
Health

**Game changers**

Sufficiency
Agroecology,
Digitalization,
New food sources

**Targets**

Sustainable diets for all

PAGE
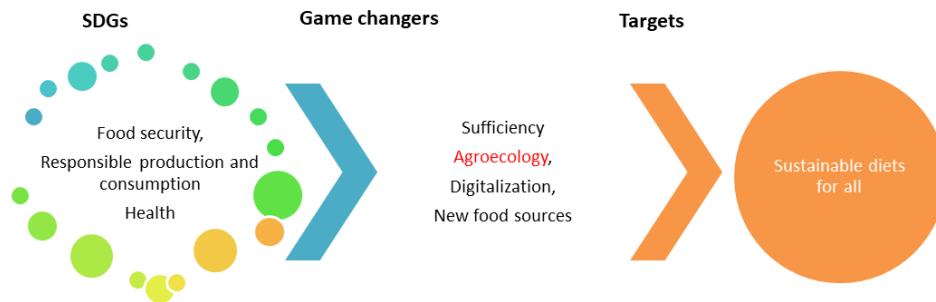
# Transition 2: Full circularity of food systems

**SDGs**

Life on land
Industry, innovation and infrastructure

**Game changers**

Biorefinery,
Digitalization,
Genetic Engineering,
Regenerative agriculture

**Targets**

100% circularity of agri-food processes

PAGE
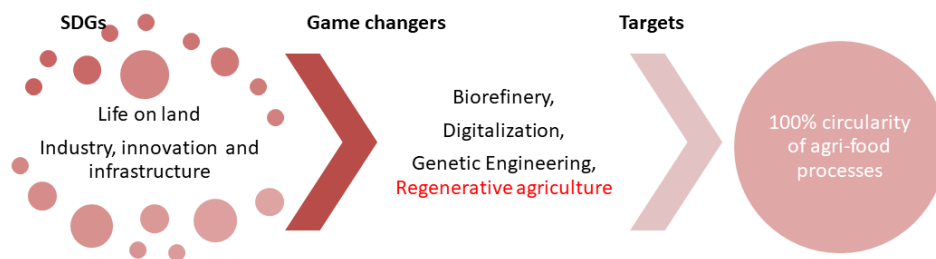
## Transition 3: Reversing diversity degradation trend

SDGs

Game changers

Targets

Life on land and below water, climate, health and wellbeing

Agroecology,
Digitalization,
Molecular biology
New business models

Reversing diversity degradation trend

PAGE

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## Ecological challenges

SYSTEM APPROACHES

ECOSYSTEM SERVICES

CIRCULARITY

REGENERATIVE AGRICULTURE

RESILIENCE

PAGE
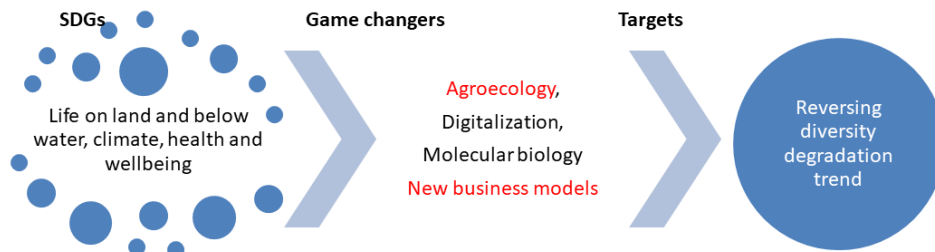
## Social challenges

PAGE

Food for all

Vibrant rural communities

Recognition of farmers' role

New lifestyles

## Economic challenges

PAGE

BUSINESS MODELS

FROM VALUE CHAINS TO FOOD SYSTEMS

DATA ECONOMIES

ETHICS AND ACCOUNTABILITY

RESILIENCE

Economic challenges

BUSINESS MODELS    FROM VALUE CHAINS TO FOOD SYSTEMS    DATA ECONOMIES    ETHICS AND ACCOUNTABILITY    RESILIENCE



Can digitalisation help?

Infra-Struct-ures

Application systems

Services

Private business

Civil society    Public administrations

impact

A Responsible Research and Innovation approach



Digitisation as development of an infosphere

PAGE
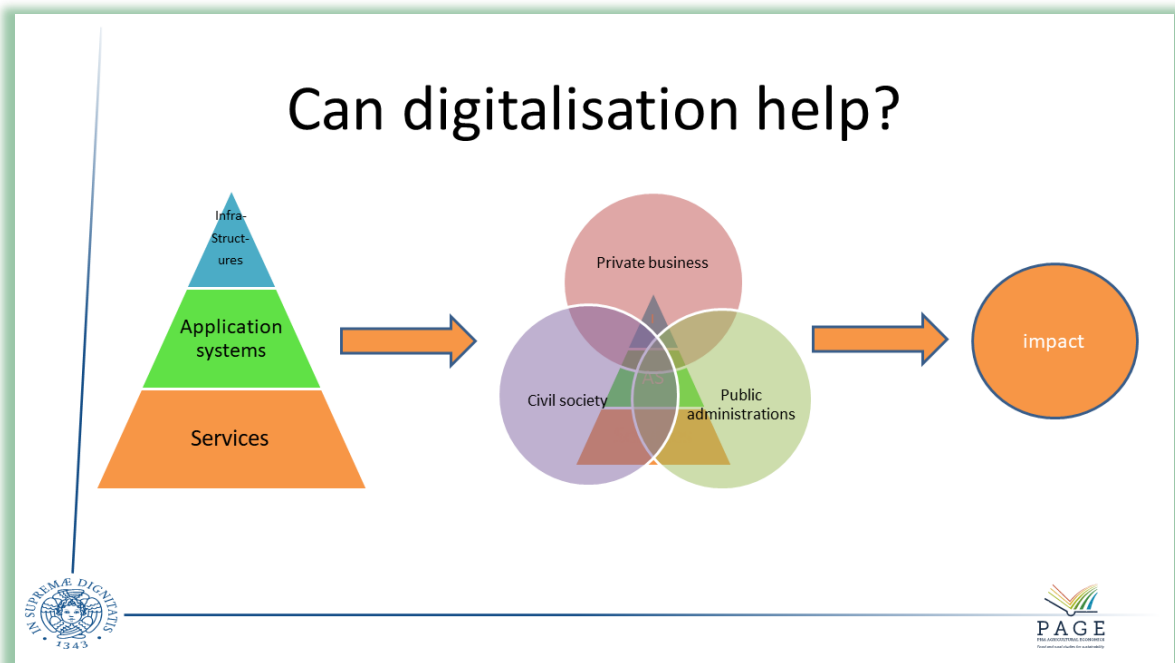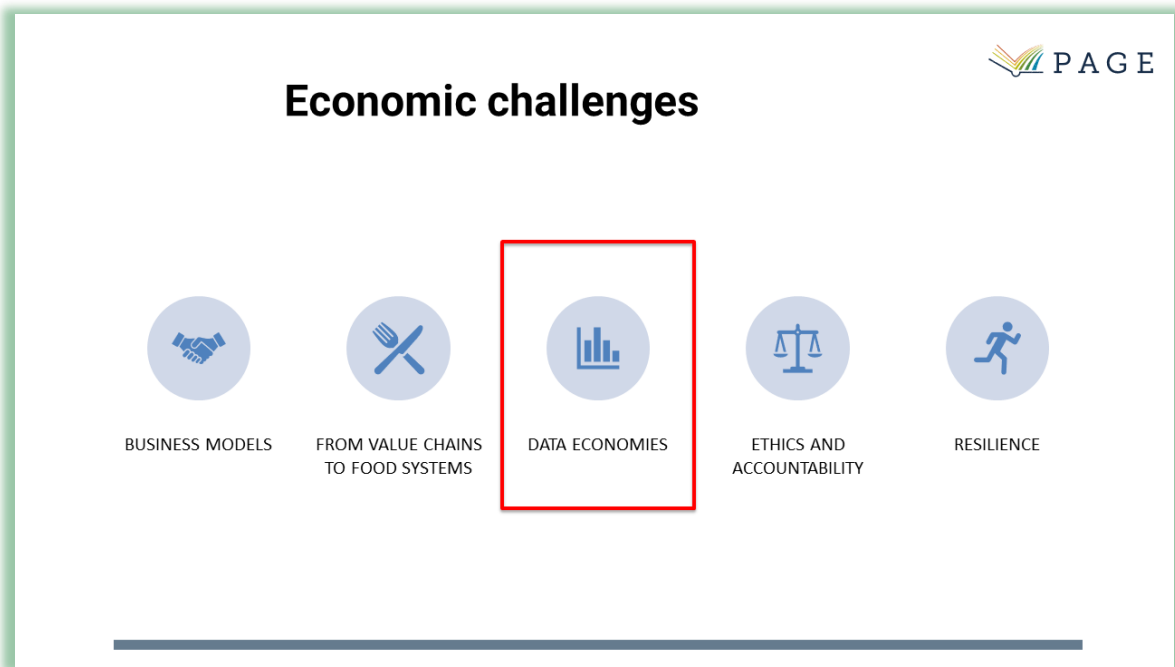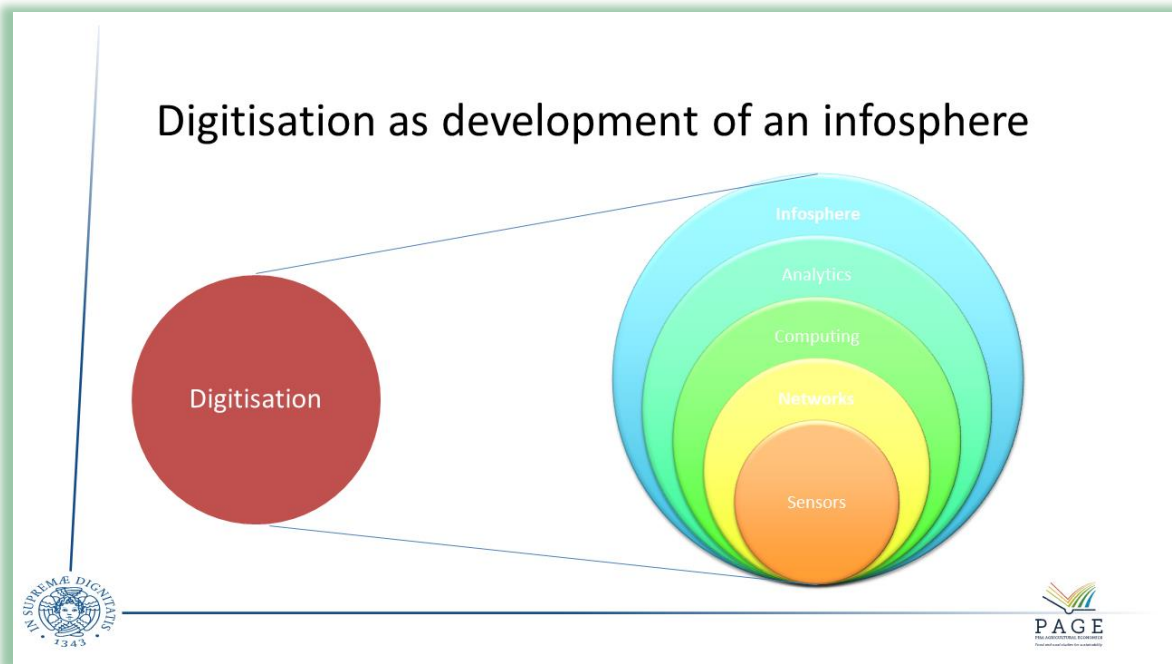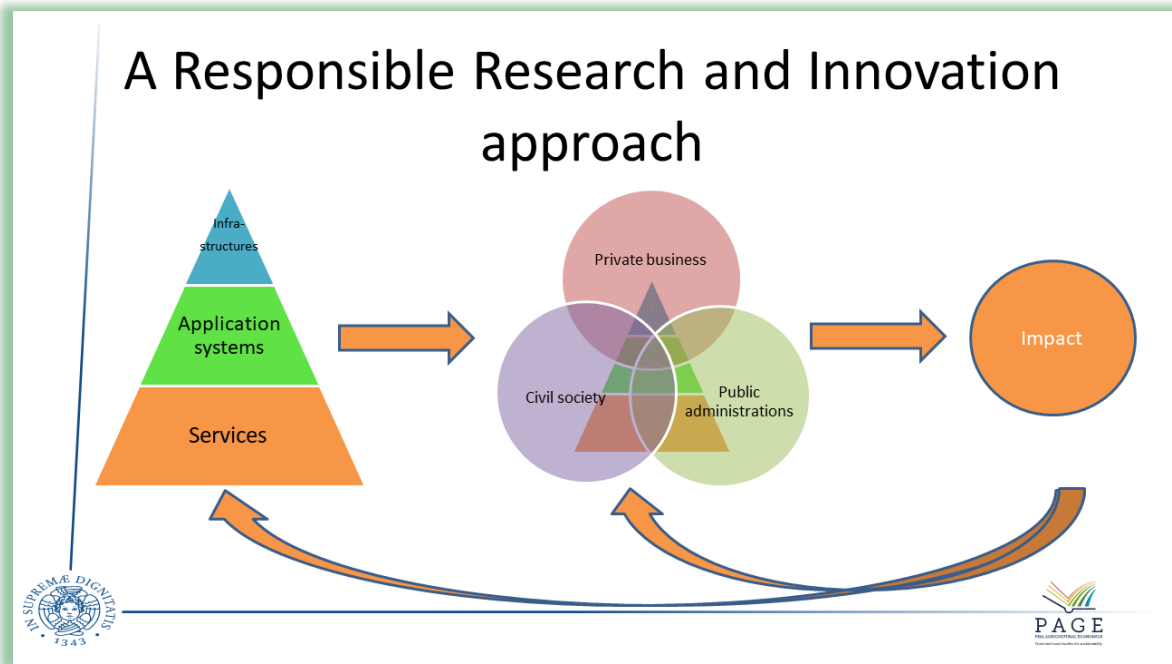
## Opportunities related to digital technologies

New modalities of interaction

Virtualisation and automation

Monitoring and tracking

Simulation and forecasting

PAGE

## Nutrition
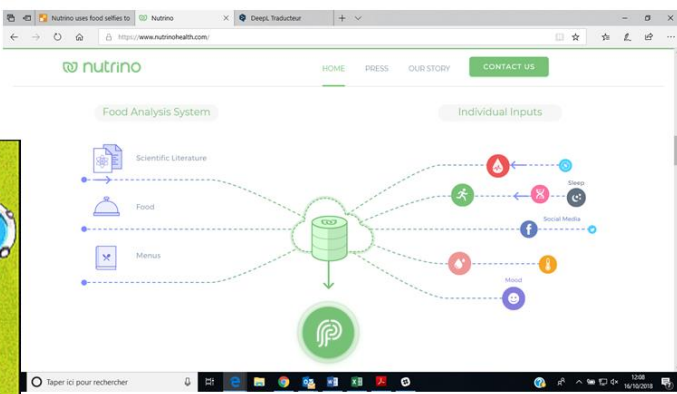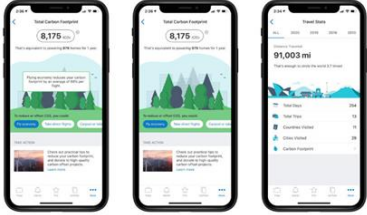
New modalities of interaction -> education, 'nudging', personalized assistance

Virtualisation / autormation -> search and comparison, gaming

Monitoring and tracking → real time feedback on eating behaviour

Simulation and forecasting → the effects of diets, early warning systems

## Nutrition



behaviour

Individual assistance

## Circularity

New modalities of interaction → search, matching supply and demand, product passport

Virtualisation → robotized waste sorting and manipulation

Monitoring and tracking → logistic optimization

Simulation and forecasting →biorefinery digital twins

Circularity

## Alvéoli Resources Sharing Market

Matching demand and supply of bioresources
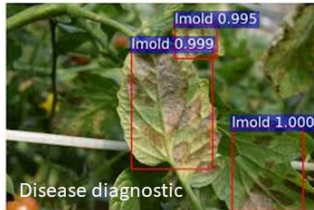
allowing agrifood businesses to swap, sell, rent or share, human, natural or material resources, know-how, information and initiatives.

Data on soil

Disease diagnostic

Imold 0.995
Imold 0.999
Imold 1.000

Waste management



Sensors

Actuators

DCS/SCADA

Digital Model

Physical Plant

Digitalisation Infrastructure

Digital Shadow

PAGE
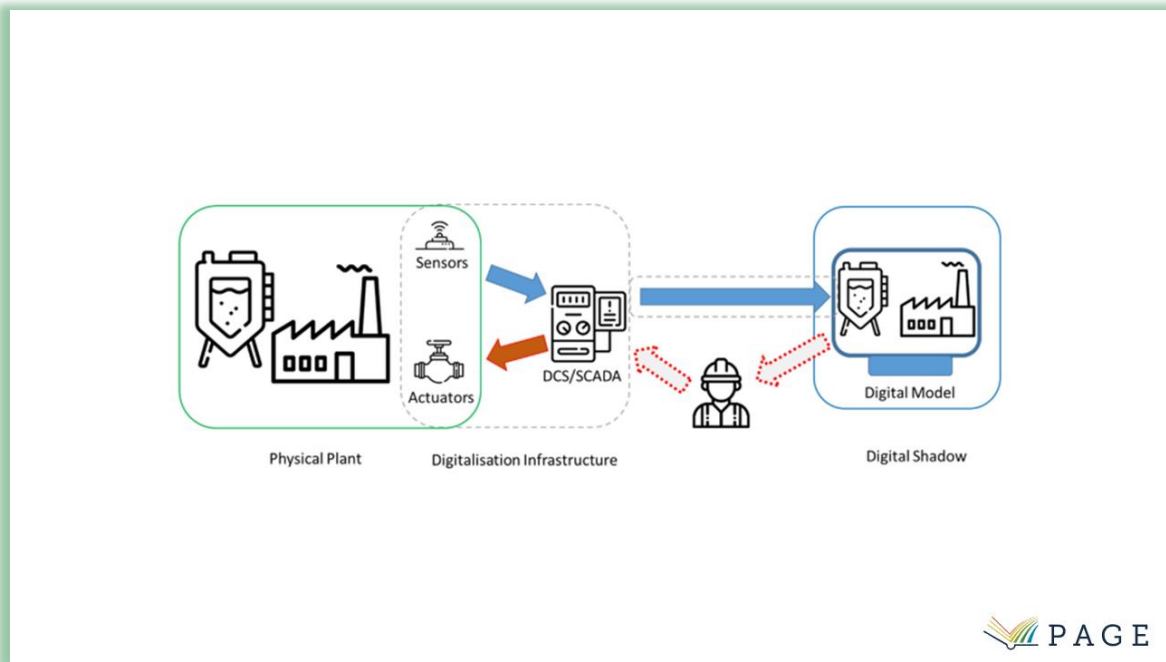
# Diversity

- New modalities of interaction → data crowdsourcing, interactive learning, seed exchanging, disintermediation

- Virtualisation → Communication, education, tourism

- Monitoring and tracking → automatic recognition, phenotyping

- Simulation and forecasting → analysis of vulnerability

PAGE

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## Diversity

Culture

**The online seed-swapping communities bringing the internet back to nature**

PAGE

# Risks

| | | | |
|---|---|---|---|
| Freedom | Privacy | Autonomy | Power unbalance |
| Divide | Security | Technology bias / nudging | Social bias |

PAGE
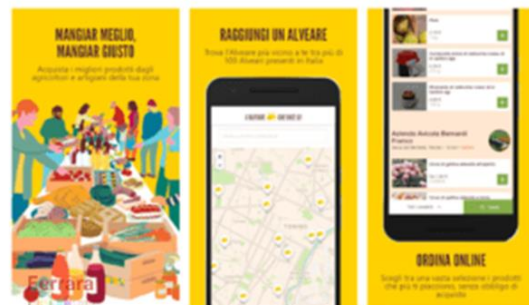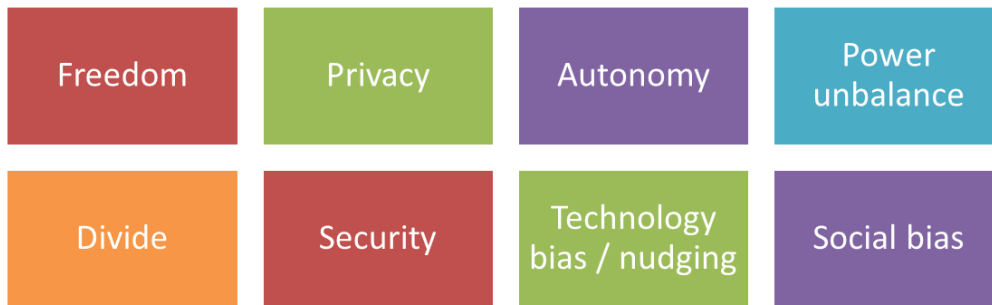
# Analysis of the potential of digitalisation

| | Diets | Circularity | Diversity |
|---|---|---|---|
| Services | Educational tools<br>Labels / Information<br>Search and comparison tools<br>'Nudging' tools<br>Digital health services<br>Digital food assistance cards | Recycling/reusing groups<br>Product-as-service | Biodiversity recognition<br>Soil assessment |
| Application systems | Personalized nutrition DSS<br>Traceability<br>Monitoring systems | Characterisation of biomass<br>Automated waste management<br>Digital twins | Farm management systems |
| Infrastructures | Life Cycle inventory databases<br>Nutritrional content databases | B2B platforms<br>Databases of biomass resources | Seed-savers exchange platforms<br>Biodiversity databases<br>Data sharing |
| | Connectivity, Satellite, Clouds, Platforms, Big Databases | | |

PAGE

# WP3: Developing Scenarios, Use Cases and Showcase Technologies

As part of the project's third work package (WP3), use case workshops were carried out to derive a use case related to the focal question. A use case in DESIRA is a means to describe the interactions among the actors and the socio-technical components of the socio-cyber-physical (SCP) system in a specific application scenario.

The methodology to develop use cases in DESIRA is derived from the notion of use case as borrowed from the system and software engineering domain. Use cases are a classical technique for representing user-system interaction and are typically defined during the early phases of software development. They are used both as a documentation means and as a live instrument to reason on the expected system behaviour and elicit potential issues, users, and implicit system requirements.

Use cases are a classical technique for representing user-system interaction in software engineering, where they are defined during the early stages of software development to represent possible user actions and expected system behaviours. Use cases are used both as documentation and as a live instrument to reason on the expected system behaviour and elicit potential issues and users. Analysts guide the reasoning process, asking questions to the stakeholders who are domain experts with a clear view of the issue at hand, available resources, and actors to be involved.

Use cases in software engineering are composed of use case diagrams, which group all the tasks to provide a complete vision, and use case specifications, which provide details for each task. In DESIRA, use cases are adapted to the concept of socio-cyber-physical systems and are regarded as high-level descriptions of the fundamental elements of a SCP system. Each Living Lab (LL) has a focal question, identifying a topic of interest for a given community in a geographical area.

The objective of the use case workshops was to collectively elicit the information needed to derive a use case related to the focal question. The workshops followed a specific methodology to elicit and formalise a use case, and the resulting use case described the interactions among the actors and the socio-technical components of the socio-cyber-physical system in a specific application scenario. The use case in DESIRA is a description of goals to be achieved, tasks supporting the goals, involved actors, and physical and digital components of a socio-cyber-physical system.

Unlike traditional use cases, in this definition, the user becomes an actor, as some of the subjects in the socio-cyber-physical system may not directly interact with the digital part of the system. Furthermore, the services offered by the system are defined as goals to be achieved, meaning that the description of the use case should make evident how the new services offered by the system meet the predefined goals. Finally, the behaviour is intended as the steps that involve interaction with the socio-cyber-physical system in terms of digital (cyber) and physical components, as well as other actors.

# Guidelines for Use Case Workshops



**Task 3.1 - Guidelines for Use Case Workshops**

Manlio Bacco, CNR Institute of Information Science and Technologies, Italy
Alessio Ferrari, CNR Institute of Information Science and Technologies, Italy

January 25th, 2022

#DESIRA2020

## Outline

- USE CASE: definition and meaning for DESIRA

- LLs carrying out use cases workshops

- Methodology and a structured example

- Template of the final report

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## WHAT IS A USE CASE

In software engineering, a use case is a list of ACTIONS performed by an ACTOR to achieve a certain GOAL through interaction with a SYSTEM.

*example*: use case for 'money withdrawal from an ATM'

- o   GOAL: money withdrawal

- o   ACTOR: user

- o   ACTIONS:

    - ■   The user inserts the card

    - ■   The user inserts its PIN

    - ■   The user selects the desired amount of money

    - ■   [...]

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## USE CASES IN THE DESIRA PROJECT

In DESIRA, we emphasize the digital as **one of the parts** of a **socio-cyber-physical system** (the LL), thus the methodology to carry out use case workshops covers also drivers, barriers, and impacts.

Thus, LLs are expected to develop **high-level use cases**. This is what one would expect after an initial iteration among analysts and users, enriched by a socio-economic perspective.

### AVAILABLE TOOLKIT

- The inventory of digital tools to browse existing or under development tech that can be used as reference / starting point
- CPS conceptualization: four layers (*sensing, transmitting, computing, and intelligence*) to be kept in mind
- Output of the WP2 workshops (*the current SCPS*)
- Output of the WP3 scenario workshops (*good scenario: desirable future*)
- Existing tech already in use / mentioned in previous workshops
- …

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## LIVING LABS carrying out use case workshops

**Four** LLs are already identified in the DoA already (SISTEMA, AMIGO, ATHENA, FRAUNHOFER) and the **fifth** one will be run by the James Hutton Institute. You should begin as soon as possible (February - May 2022).

### Additional Living Labs are welcome to join!



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## INFOGRAPHIC



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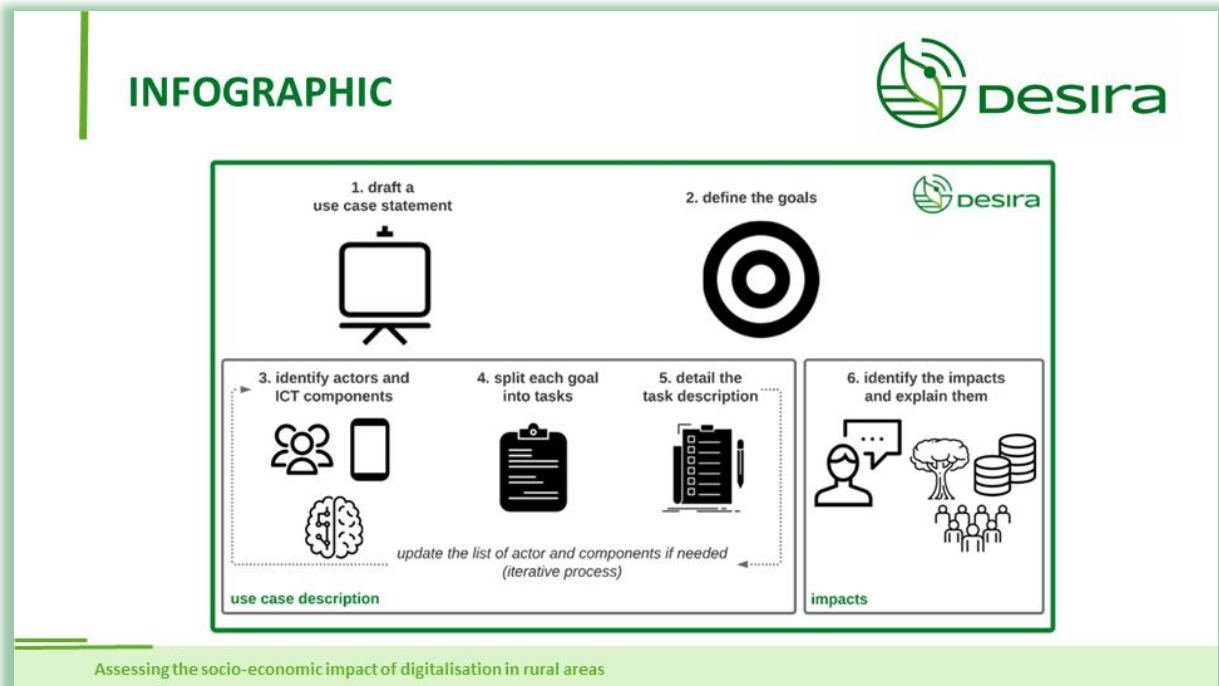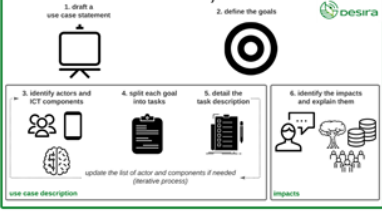
## Suggested organisation of the work/1

Our suggestion is to split the work into **five steps:**

1. preparatory work (by the LL coordinator);
2. focus group(s) with a few representative stakeholders [*steps 1-5 of the infographic*];
3. structure / organise the elicited information (by the LL coordinator). A preliminary draft of the report can be sent to CNR for feedback;
4. plenary workshop [*step 6 of the infographic*];
5. draft report finalised and sent to CNR.



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## Suggested organisation of the work/2

1. **preparatory work (by the LL coordinator);**
2. focus group(s) with a few representative stakeholders [*steps 1-5 of the infographic*];
3. structure / organise the elicited information (by the LL coordinator). A preliminary draft of the report can be sent to CNR for feedback;
4. plenary workshop [*step 6 of the infographic*];
5. draft report finalised and sent to CNR.

Start from the *GOOD* scenario definition (scenario workshops) and its results:

1. preliminary search of **applications / solutions of interest** in the e.g., DESIRA Gnomee to be used as examples / references; gather information about digital tools mentioned in previous workshops as needed;
2. selection of **relevant participants** to be invited as part of the focus group.

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## Suggested organisation of the work/3

1. preparatory work (by the LL coordinator);
2. **focus group(s) with a few representative stakeholders [*steps 1-5 of the infographic*];**
3. structure / organise the elicited information (by the LL coordinator). A preliminary draft of the report can be sent to CNR for feedback;
4. plenary workshop [*step 6 of the infographic*];
5. draft report finalised and sent to CNR.

suggested size of the groups is **5 to 7 participants** maximum (including the LL coordinators), mixing stakeholders with a more technical background with other actors representative of different interests (e.g., farmers, local institutions, private companies, …).

The group should:

1. define what is the overall objective (the *use case statement*);
2. identify goals, actors, and resources (ICT components) needed to achieve the objective;
3. describe how the actors can achieve the goals thanks to the resources (*task descriptions*).

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## Suggested organisation of the work/4

1. preparatory work (by the LL coordinator);
2. focus group(s) with a few representative stakeholders [*steps 1-5 of the infographic*];
3. **structure / organise the elicited information (by the LL coordinator). A preliminary draft of the report can be sent to CNR for feedback;**
4. plenary workshop [*step 6 of the infographic*];
5. draft report finalised and sent to CNR.

LL coordinator(s) structure the gathered information: the output of the work in the focus group should be organized in preparation for the plenary workshop.

In this phase, you can reach out to us as **preliminary checkpoint**. We warmly recommend providing us with a **preliminary report** at this stage to make sure everything is on track.

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## Suggested organisation of the work/5

1. preparatory work (by the LL coordinator);
2. focus group(s) with a few representative stakeholders [*steps 1-5 of the infographic*];
3. structure / organise the elicited information (by the LL coordinator). A preliminary draft of the report can be sent to CNR for feedback;
4. **plenary workshop [*step 6 of the infographic*];**
5. draft report finalised and sent to CNR.

All the participants to the previous workshops should be invited; expected duration is ~4 hours. The aim is in presenting the work done in the focus groups to **collect feedback** and **refine the output**. In this way, all participants are **aware** of the proposed solution / system and (likely) agree on its high-level design (*step 4.1*)

After that, the plenary session must focus on the identification of potential **drivers** and **barriers** for the use of the proposed ICT solution, and identify plausible **impacts** in the context of the Living Lab (*step 4.2*)

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## Suggested organisation of the work/6

1. preparatory work (by the LL coordinator);
2. focus group(s) with a few representative stakeholders [*steps 1-5 of the infographic*];
3. structure / organise the elicited information (by the LL coordinator). A preliminary draft of the report can be sent to CNR for feedback;
4. plenary workshop [*step 6 of the infographic*];
5. **draft report finalised and sent to CNR.**

The **draft report** must be sent to us within the **end of May**, and the deliverable will be finalised within the end of July. We will contact you if clarifications are needed.

Please share the intermediate draft with us, so that we are aware of how things are going and we can provide support if needed.

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## LET'S GO THROUGH THE STEPS
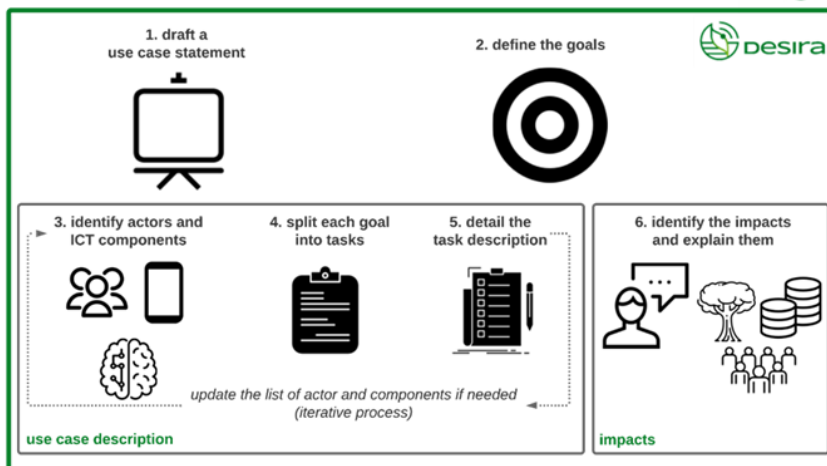


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## STEP 1: use case statement (focus group)

**INITIAL STEP**

Starting from the LL focal question and using *the positive and plausible (GOOD) output of the scenario workshop* as main input, define a **clear, realistic,** and **generalisable** USE CASE STATEMENT.

**Clear** means that it is well defined and not ambiguous (for at least all participants to the workshop).
**Realistic** means that the objective stems from the LL focal question and is feasible with known / existing tech (*do not look too far*).
**Generalisable** means that the objective should be achievable in general settings as much as possible (not contextually constrained by the LL - for instance, too strict constraints in terms of costs, certification, permissions from authorities, ...): in this way, the output can be generalized to (reused in) other contexts.

## STEP 1: use case statement derived from the focal question - an example

**Focal question:** how to reduce the risk of forest fires?

**Use case statement:** the goal of the system is to improve prevention and control of forest fires involving citizens, public authorities, and other subjects. The system relies on a mobile app, data collected from different sources (e.g. satellite, citizens through the app, ...), and the use of aerial drones in dangerous situations.

## STEP 1: the goals in the use case statement

Once the participants agree on a brief and clear statement, the main goal(s) in it must be outlined. If the use case statement is written in an effective way, identifying goals should be rather easy.

From the previous example, the following **goals** can be derived from it:
1. *prevention of forest fires;*
2. *control forest fires;*
3. *involve community.*

Goals are unlikely to contain **technological elements** in them (e.g., use of data, mobile app, drones), instead focusing on other dimensions or immediately defining plausible **actions**. Keep this in mind as a rule of thumb to make sure that *i)* goals are understandable by everyone and *ii)* they are defined as needed.

The statement should also mention some **entities**, such as actors (citizens, public authorities etc), **tools** (a mobile application), **data / data sources** of interest (satellite), and so on. The statement can already contain a few details like these to clarify the direction of investigation; yet, those are not goals, but rather **elements** to be used to achieve the goals.

## USE CASE SPECIFICATION (focus groups)

Use case specification, composed as follows:

- **actors:** involved actors (e.g., *firefighters, citizen, municipality, local agency*);
- **goals:** desired objectives to be achieved by the system as described in the use case statement (e.g., *prevent fires, control fires, involve citizens*). The goals are the motivations behind the development of the systems;
- **tasks:** activities performed by actors by/through/with the system to achieve the goals (e.g., *periodical checks, planning interventions*);
- **ICT components:** digital components used by actors to perform tasks (e.g., *intervention planning platform, mobile phones, GIS, drones, sensors*);
- **task descriptions:** step-by-step textual specifications of how tasks are performed by the actors to achieve a certain goal, taking into account: actors involved, action performed in each step and motivation for the action. Ideally, each step should describe a single action, but can involve multiple actors.

## DRIVERS, BARRIERS, IMPACTS (plenary workshop)

**impacts:** potential desired and undesired short and long-term consequences related to the development of the system. The goals of the system, if achieved, may have certain impacts. Impacts belong to the following dimensions: **social, environmental, economic, and governance.**
**example** *environmental: greater protection of trees in the area. social: greater sense of community.* Impacts can be positive or negative. *economic: increased tourism in the area (positive). social: exclusion of subjects who cannot use technology (negative).*

**drivers:** any factor (phenomenon, event, or individual/collective need) that could facilitate the achievement of a certain goal. Drivers belong to the following dimensions: *social, environmental, economic, and governance.*
**example** *economic: increased funding from Europe. governance: need to increase control of the area.*

**barriers:** any factor (phenomenon, event, or individual/collective opposition) that could hinder the achievement of a certain goal. Barriers: belong to the following dimensions: *social, environmental, economic, and governance.*
**example** *governance: complexity of regulations. social: opposition to technology; aging population.*

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## EXAMPLE: Developing a Use Case Specification

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## USE CASE STATEMENT

**Focal question:** how to reduce the risk of forest fires?

**Use case statement:** the goal of the system is to improve prevention and control of forest fires involving citizens, public authorities, and other subjects. The system relies on a mobile app, data collected from different sources (e.g. satellite, citizens, ...), and the use of aerial drones in dangerous situations.

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## EXAMPLE 1

### GENERAL OBJECTIVE: prevention and control of forest fires

**Actors**

- a. residents (people living nearby the forest)
- b. tourists
- c. firefighters
- d. local agencies
- e. municipalities
- f. ...

**Goals**:

- a. *Fire Prevention*: residents, tourists, local agency
- b. *Fire Control*: firefighters, local agency, municipalities
- c. *Involve Community*: local agency, residents

**WHO** are the actors involved? (individuals, groups, organisations...)

**WHY** are we developing this system? What are the objectives that we want to achieve?

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## EXAMPLE 1 (Graphical)



**GOALS**: Prevention of Forest Fires, Control of Forest Fires, Involve Community

**ACTORS**: Firefighter, Local Agency, Municipality, Tourists, Residents

STEP 1: Identify Goals and Actors
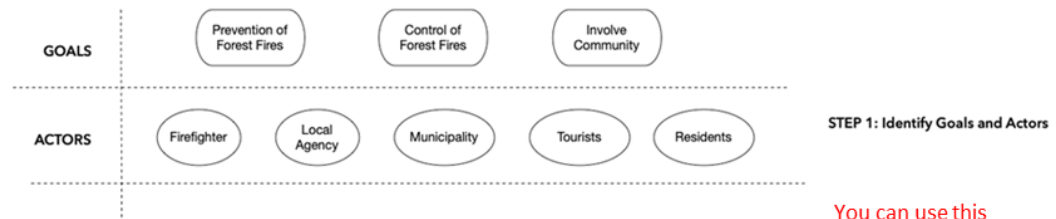
You can use this diagram to support the discussion

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## EXAMPLE 2

**Tasks** (this is where *domain experts* are critically needed):

**Fire prevention** (*goal 1*)
1. Plan and execute periodical checks of the forest (*task 1.1*)
2. Plan and execute periodical cleanings to dispose of dry vegetation in guard areas (*task 1.2*)
3. Conduct informative campaigns to make residents aware of the risks (*task 1.3*)
4. Set-up of safe zones to be used in the case of danger (*task 1.4*)

**Fire control** (*goal 2*)
1. monitoring/controlling small fires (*task 2.1*)
2. monitoring/controlling dangerous wildfires (evacuating people) (*task 2.2*)
3. extinguish wildfires and monitoring activities once the fire is out (*task 2.3*)

**Involve community** (*goal 3*)
1. develop app to enable communication from citizens (*task 3.1*)
2. publicise app (*task 3.2*)
3. monitor app usage (*task 3.3*)

**WHAT** are the activities that are carried out by the actors to achieve the goal?

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EXAMPLE 2 (Graphical)

STEP 2: Identify Tasks for each Goal

GOALS — Prevention of Forest Fires

TASKS — Periodical Checks | Periodical Cleaning | Informative Campaign | Setup Safe Zones
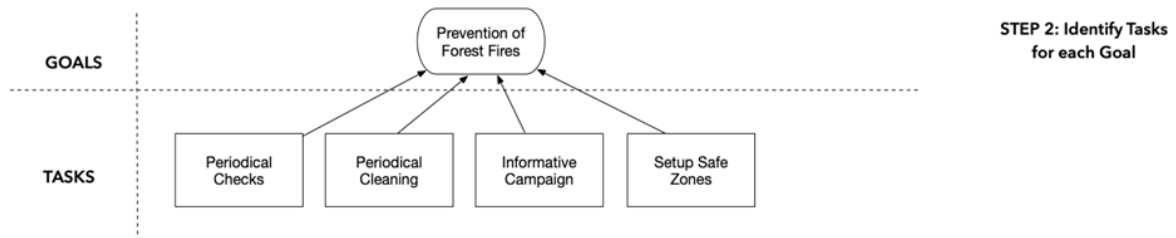
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EXAMPLE 3

WHAT ICT components do we plan to use to support the tasks?

## ICT components:

- **mobile phones:** selected because residents mostly use smartphones that can be used to communicate through e.g., a mobile app;
- **cloud-like platform** managed by the local agency to collect and analyse data coming from sensors in the forest or from satellite imagery, to store reports, to access the history of wildfires, and so on;
- terrestrial and aerial **drones** to be used to scout areas during dangerous wildfires; to follow firefighters so that a command centre can know and see where they are during the action; to guide civilians during evacuation procedures; and so on.

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# EXAMPLE 3 (Graphical)

| | | | | |
|---|---|---|---|---|
| **GOALS** | Prevention of Forest Fires | Control of Forest Fires | Involve Community | |

**ACTORS:** Firefighter, Local Agency, Municipality, Tourists, Residents

**STEP 3: Identify ICT components**

**ICT Components:** Mobile Phones, Cloud Platform, Sensors, Drones

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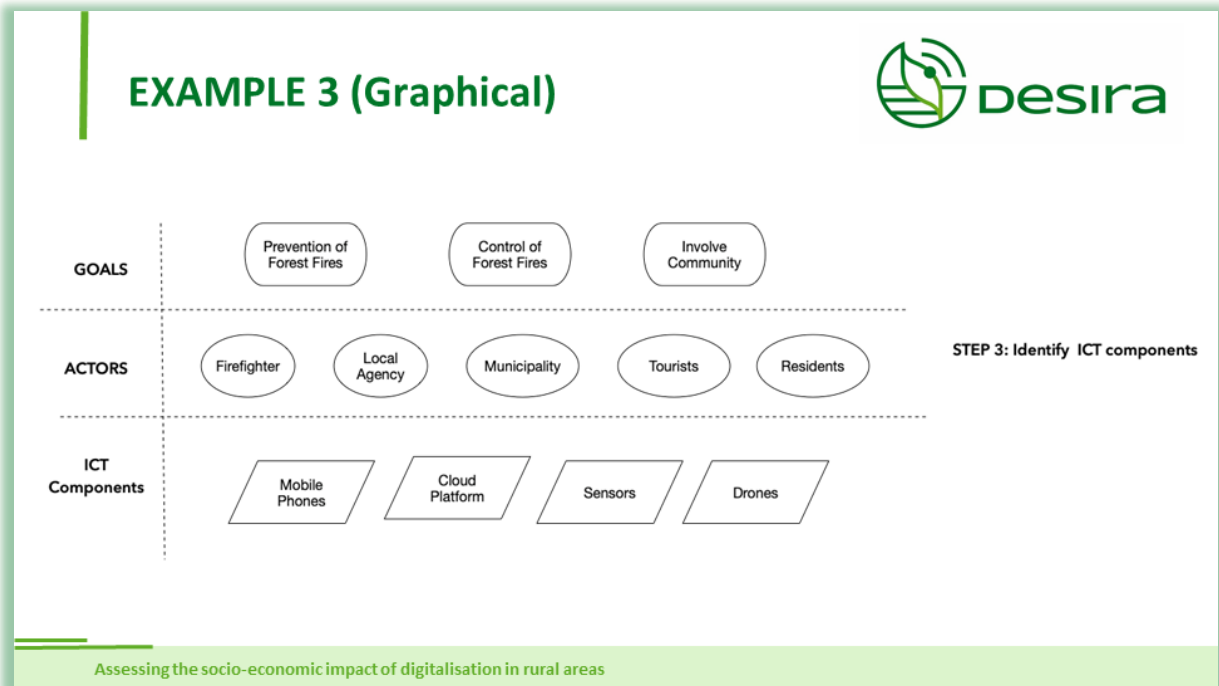
# EXAMPLE 4

**HOW** will the tasks be performed?

**Task description** (*additional ICT components, resources, tasks and goals may emerge during this process*):

1. Fire Prevention (this is the goal)
   a. Periodical checks (this is the task)
      i. a local agency is in charge of performing periodical checks

You can also say that the task is not performed at all!

   1. *How is this performed today?*
      a. Local agency representative indicates the zones that have higher priority for checks in a physical map
      b. Local agency representative establishes dates for checks in a diary
   2. *Which are the weaknesses/issues of the current approach?*
      a. Physical map is not automatically updated
      b. Physical maps and documents are hard to navigate and search
      c. Lack of automatic updates of the information
   3. *How can this be supported by an ICT system / digital tool?*
      a. Local agency representative uses a digital map and flags the areas for check
      b. Local agency representative add notes to the digital map to schedule when a check should be performed

This is the task description

      c. Local agency sends personnel to check status of designated area according to the plan
      d. Personnel reports the status of the area to local agency
      e. Local agency takes action based on the reported status

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# EXAMPLE 4 (remark)

**Make an effort to express the steps in the following format:**

**The [ACTOR] does [ACTION] because/to [MOTIVATION]**

(e.g., *the local agency flags geographical areas in a digital map for future checks to ensure low risk of fires in those places*)

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# EXAMPLE 4 (Graphical)

**Task description (continued):**
[...]

o **actors involved**
-local agency
-residents
o **ICT components:**
-cloud platform
-local agency program for planning

For each task, specify the actors involved, and the ICT components

Periodical Checks

Cloud Platform

Local Agency
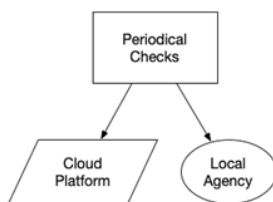
- How is it performed right now?

- What are the weaknesses?

- How can it be supported by a digital tool (ICT Components)?

- Who are the involved Actors?

STEP 4: Describe the Tasks
(can lead to more Actors,
and ICT components in the initial list)

## EXAMPLE 5 - IMPACTS (workshops)

IF the system were to be developed and used, which IMPACTS do you foresee in both the short and the long term?

For each goal, with associated tasks, ask the following question:
- *what could be the impact of this goal, achieved through those tasks, from the **economic** viewpoint?*
- *what could be the impact of this goal, achieved through those tasks, from the **social** viewpoint?*
- *what could be the impact of this goal, achieved through those tasks, from the **environmental** viewpoint?*
- *what could be the impact of this goal, achieved through those tasks, from the **governance** viewpoint?*

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## EXAMPLE 5 (workshops)

| Tasks | Goals | IMPACT |
|---|---|---|
| periodical checks periodical cleaning informative campaign setup safe zones | Prevention of Forest Fires | **Economical:** less resources for controlling wildfires<br>**Social:** more sense of safety<br>**Governance:** less emergency<br>**Environmental:** less wildfires, more vegetation |
| .... .... .... | Control of Forest Fires | **Economical:** …<br>**Social:** …<br>**Governance:** …<br>**Environmental:** … |
| .... .... .... | Involve Community | **Economical:** …<br>**Social:** …<br>**Governance:** …<br>**Environmental:** … |

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## EXAMPLE 6 - DRIVERS (workshops)

**What are the DRIVERS that can facilitate the actual realisation of the system in practice?**

For each goal, with associated tasks, ask the following question:
- *What could be the **economic** drivers for achieving this goal, in the context of the Living Lab?*
- *What could be the **social** drivers for achieving this goal, in the context of the Living Lab?*
- *What could be the **environmental** drivers for achieving this goal, in the context of the Living Lab?*
- *What could be the **governance** drivers for achieving this goal, in the context of the Living Lab?*

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## EXAMPLE 6 (workshops)

| Tasks | Goals | DRIVER |
|---|---|---|
| periodical checks<br>periodical cleaning<br>informative campaign<br>setup safe zones | Prevention of Forest Fires | **Economical:** regional investments<br>**Social:** citizens demands<br>**Governance:** need to adhere to regulations<br>**Environmental:** need for forest preservation |
| ....<br>....<br>.... | Control of Forest Fires | **Economical:** …<br>**Social:** …<br>**Governance:** …<br>**Environmental:** … |
| ....<br>....<br>.... | Involve Community | **Economical:** …<br>**Social:** …<br>**Governance:** …<br>**Environmental:** … |

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# EXAMPLE 7 - BARRIERS (workshops)

**What are the BARRIERS that can act as obstacles towards the development of this system?**

For each goal, with associated tasks, ask the following question:
- *What could be the **economic** barriers for achieving this goal, in the context of the Living Lab?*
- *What could be the **social** barriers for achieving this goal, in the context of the Living Lab?*
- *What could be the **environmental** barriers for achieving this goal, in the context of the Living Lab?*
- *What could be the **governance** barriers for achieving this goal, in the context of the Living Lab?*

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# EXAMPLE 7 (workshops)

| Tasks | Goals | BARRIER |
|---|---|---|
| periodical checks periodical cleaning informative campaign setup safe zones | Prevention of Forest Fires | **Economical:** insufficient funding <br> **Social:** – <br> **Governance:** difficulties with planning <br> **Environmental:** difficulty in accessing some areas |
| .... .... .... | Control of Forest Fires | **Economical:** … <br> **Social:** … <br> **Governance:** … <br> **Environmental:** … |
| .... .... .... | Involve Community | **Economical:** … <br> **Social:** … <br> **Governance:** … <br> **Environmental:** … |

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# Guidelines for digital storytelling

## What are digital stories?

Digital stories are a short form of digital media output, which are used to communicate a narrative. They were originally developed as means of engaging community members in artistic practice. One of the early pioneers was Joe Lambert who 20 years ago founded the Center for Digital Storytelling[2] to empower individuals to embrace creative expression and community building. Digital storytelling was later embraced in higher education settings, and finally by researchers as a tool for co-productive research and dissemination. As an approach, it is now used practiced in many settings including in teaching, research, the Arts, and community engagement.

Digital storytelling is the practice of using multimedia tools to bring stories to life. Digital stories can include digital elements of audio (voice, music, sounds), video and images (photos, illustrations, maps etc.). These elements are combined to produce a digital (video-based) output typically between 2-5 minutes long. Many sources suggest that around 3 minutes is ideal[3], so this is what we recommend for the digital stories produced in the DESIRA project.

## Why use digital storytelling in DESIRA?

Digital storytelling is a creative approach that engages researchers and participants. It allows individuals to share stories from their own perspectives, which is incredibly useful on a research project which aims to capture and share multiple perspectives across different living lab contexts. Digital stories are compelling and accessible, meaning that they can be used to reach a broad audience with our DESIRA findings and insights. In turn, this has the potential to increase the impact of the project by sharing its outputs with as many relevant stakeholders as possible. Digital stories can be used to share a number of different types of narratives, including ideas and concepts, context of our research, and findings from the research such as the future narratives that we are producing with our living labs.

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[2] https://www.storycenter.org/storycenter-blog/blog/2013/2/26/full-circle.html
[3] https://learningcommons.lib.uoguelph.ca/item/what-digital-storytelling

# How to make a digital story – step by step

Figure 3. Step by step on how to make a digital story

| 1. Develop idea/proposal | 2. Research/explore | 3. Write the script | 4. Storyboard (plan) |
|---|---|---|---|
| 5. Gather materials (audio, video, images etc.) | 6. Put it all together | 7. Share | 8. Feedback |
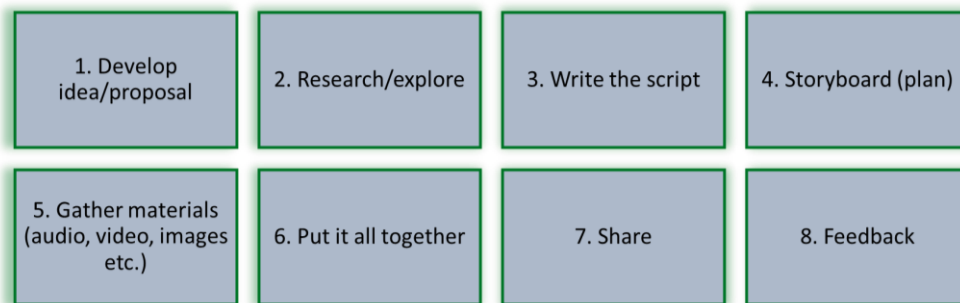
Digital storytelling involves a number of steps as illustrated in Figure 1.

1. Develop your idea/proposal: in DESIRA, at least 2 of your 4 digital stories (per living lab) will be based on scenario narratives co-produced in WP3. You have the flexibility to decide on the content of the other two (or you may decide with your living lab members). Some ideas are provided later.

2. Research/explore: this is a typical step in creating a story, to make sure you know enough of the background to create a narrative (or script). In DESIRA, this is something you are doing in the research with the living labs already.

3. Write the script: for at least 2 of the scenarios, the script will be based on the narratives produced (better not best, and worse not worst).

4. Storyboard – this is the planning stage that allows you to map out the elements of your story. It might help if you draw frames out visually, then make notes of what each frame will cover (in terms of audio and visual content).

5. Gather materials (audio, video, images etc.). These are the building blocks of your digital story.

6. Put it all together: You will use video editing software on a digital device to combine the elements together into a cohesive output.

7. Share: sharing stories with others is a vital step in storytelling. You will share the stories with others in your living lab (either in a digital storytelling workshop or later, online).

8. Feedback: Feedback is an important step in digital storytelling, as it is considered a co-productive process. Feedback will be encouraged between living lab members on the stories created. We will also provide feedback at Hutton as to any technical requirements on your draft stories.

This video is helpful on how to create a digital story:

https://www.youtube.com/watch?v=LVKeO5IIR_A

You will need to decide which hardware you will use. You can either use a PC, laptop, or tablet device. If you are running digital storytelling workshops, tablets are ideal (and each living lab has a budget of €1,200 to buy tablets with).

You will also need to decide on software. There are a number of software applications that you can use (and you may have access to, or experience with a preferred software already). You are free to choose which software to use, and Hutton team can help advise. Examples of software include WeVideo, InShot, iMovie and Final Cut. Note that some are designed for/best for laptops and PCs, whilst others work well on mobile devices, or both.

In DESIRA we have access to WeVideo[4], which is a popular tool used for digital storytelling. We also have access to a number of training videos, which were created during the H2020 AgriLink project (credit to Scott Herrett and Alba Juarez Bourke, the creators of these training videos) – see Figure 2.

Figure 4. WeVideo tutorial links

**WeVideo tutorials:**

WeVideo tutorial 1: Media upload
https://vimeo.com/manage/videos/486934346/2bd7590385

WeVideo tutorial 2: Introduction to editing
https://vimeo.com/manage/videos/487138698/fb870b45f4

WeVideo tutorial 3: WeVideo direct audio editing
https://vimeo.com/manage/videos/487139438/df95232673

WeVideo tutorial 4: Audio levels https://vimeo.com/manage/videos/487140166/a089d7a457

WeVideo tutorial 5: Panning and zoom effects
https://vimeo.com/manage/videos/487140822/e5d69f1c1a

WeVideo tutorial 6: Titles, transitions, and finish
https://vimeo.com/manage/videos/487141600/569dd9825a

If you would like to use WeVideo for your digital storytelling activities, please contact the Hutton team, who will discuss the options with you in more detail.

## Digital storytelling activities

**GATHERING MATERIALS**

The building blocks of a digital story are multimedia and can include:

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[4] https://www.wevideo.com/

- Images

- Audio

- Video

- Graphics

- Text etc.

You can take a number of approaches to gathering the relevant materials. For example, you can work with your living lab members who can gather materials before the workshop (e.g. their own photos and video taken in the past or deliberately gathered for this exercise), or even during the workshop (from online resources). You may also gather materials yourself (e.g. photos taken at the living lab locality/workshops, or found online). There are a number of free resources available online to gather **royalty free** materials. We recommend: Pixabay for images and Uppbeat for audio.

## DIGITAL STORYTELLING WORKSHOPS

You may choose to hold dedicated digital storytelling workshops with your living labs. Given the restrictions of the last two years, it is likely you will have spare travel funds to make this happen. This could be considered as a good opportunity to extend your engagement with/learning from your living lab. However, Covid-19 restrictions keep changing, so you will need to be flexible and decide whether a face-to-face workshop is possible. If it is not, it might be difficult to hold such a workshop online as this is a very hands-on process. In the case that you cannot run a workshop with your living lab, try to involve living lab members as much as possible in the process, by asking them to help you with the scripting, and gathering of audiovisual materials. They may even provide voiceovers and can be involved in the sharing and feedback process.

Ideally, you would produce at least 2 of the 4 digital stories required (per living lab) with some kind of collaboration with your living lab members.

If you are able to run a workshop, consider splitting the participants into groups to work on stories. Two groups might be ideal (producing at least one story each in the workshop), but this is flexible. Your budget covers you well for two tablets, which is ideal for working with two groups. Figure 3 shows a potential workshop plan, but you are free to design your workshop in the way that you think works best for your group.

Table 1. Example plan for digital storytelling workshop

| Activity | Time | Timing | Aims |
|---|---|---|---|
| **Introductions and ice breaker** | 10am | 10 minutes | Participants are relaxed and networked |
| **Explain aims and approach of the workshop** | 10.10am | 10 minutes | Participants understand the expected aims of the workshop |
| **Introduce the two scenario narratives to be used in stories** | 10.20 | 15 minutes | Reminder for participants of the narratives |

| | | | |
|---|---|---|---|
| **Split into two groups based on preferred narrative to work with** | 10.35 | 5 minutes | Participants choose which group they prefer to develop a story in |
| **Break** | 10.40 | 10 minutes | Comfort break |
| **Discuss story idea** | 10.50 | 20 minutes | Confirm story is based on narrative, or introduce new elements etc. |
| **Script the story** | 11.10 | 30 minutes | Based on narrative |
| **Storyboard** | 11.40 | 30 minutes | Plan out the story with the storyboard, illustrate with post its or on large sheets of paper etc. |
| **Gather materials** | 12.10 | 20 minutes | Using online resources and what was already prepared |
| **Lunch break** | 12.30 | 45 minutes | Lunch |
| **Training on using the video editing and hardware** | 13.15 | 20 minutes | Facilitator in each group demonstrates key features and is on hand to support throughout |
| **Construct digital story** | 13.35 | 45 minutes | Put all elements together on the software. Record voiceover element in native language |
| **Share stories** | 14.20 | 20 minutes | Stories are shown on projector screen |
| **Feedback and discussion** | 14.40 | 35 minutes | Discussion and feedback on stories and the process. Facilitators capture notes of the discussion. |

**OUTPUTS**

The proposal states that we will deliver **80 digital stories.** This means that each living lab is required to deliver **4 digital stories.**

We would like you to produce 2 digital stories representing your scenario narratives:

- "Better not best"
- "Worse not worst"

2 additional digital stories are required. The topic of these is flexible, here are some ideas for content:

- Living Lab context (see for example "Scottish LL Digital Story.mov") on the VRE, under WP3/Digital Stories
- Best and worst scenario narratives
- Individual case study within your living lab

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- Highlight a particular aspect of findings, theory etc.

We would like you to produce stories which have voiceover audio in your living lab's national language, we would like all non-English language digital stories to also include subtitles in English language (contact Hutton team if you require help with this aspect).

The narrative of your story should be clear and accessible, using language which is understandable for most people. We want these digital stories to have as wide an impact as possible.

Finally, there are some branding requirements – we need to ensure each digital story includes the DESIRA logo and EU Acknowledgement. Logos are provided on the VRE (in the WP3 folder go to "Digital Stories" then "Branding").

Find information for acknowledging the EU at the following link:

https://ec.europa.eu/research/participants/docs/h2020-funding-guide/grants/grant-management/acknowledge-funding_en.htm

**Text to include:** This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 818194.  The content of this video does not reflect the official opinion of the European Union. Responsibility for the information and views expressed therein lies entirely with the video creator(s).

We will also provide a (very short and simple) template for you to complete, to describe the stories that were produced.

**The Hutton team will provide feedback on your first draft of stories to ensure that you have included the correct formatting, logos etc.**

## Timeline

This is the timeline for digital stories:

- Storytelling activities – ongoing, until February

- First draft of digital stories – end of February

- Review and feedback process – first half of March

- Finalised stories – end of March

- (Very brief) document outlining your stories – end of April

- Sharing on website, YouTube channel etc. – April onwards

## Resources and support

We will provide training in early December, and this training will be recorded and available to view on the VRE, along with the slide set. We will also provide two one-hour drop-in support sessions online (one in January and one in February – times TBD). We can also provide one-to-one support where a team is struggling – please consider using this option only if you cannot find the support you need in the training/this document and other resources we provide, as we do not have the resources at Hutton to individually train each living lab team.

Remember that you have budget for equipment, and access to WeVideo if you would like to use this platform.

## Additional resources - AgriLink digital stories:

- Triggering change: [Triggering Change Video (wevideo.com)](#)

- Impartial advice: [Impartial Advice - AgriLink Digital Story (wevideo.com)](#)

- What is digital storytelling:

  [https://guides.lib.uoguelph.ca/DigitalStory#:~:text=Digital%20Storytelling%20is%20a%20form,Explain%20a%20concept](https://guides.lib.uoguelph.ca/DigitalStory#:~:text=Digital%20Storytelling%20is%20a%20form,Explain%20a%20concept)

- Digital storytelling explained: [https://learningcommons.lib.uoguelph.ca/item/what-digital-storytelling](https://learningcommons.lib.uoguelph.ca/item/what-digital-storytelling)

- WeVideo YouTube channel (for lots more useful resources):

  [https://www.youtube.com/channel/UCYKxnjdIcWS8_Uxn7zWZUSA](https://www.youtube.com/channel/UCYKxnjdIcWS8_Uxn7zWZUSA)

- Getting started with WeVideo: [https://www.youtube.com/watch?v=qeTE1kGnTas](https://www.youtube.com/watch?v=qeTE1kGnTas)

# Scenario Planning Workshop

The Scenario Planning materials display a methodology to plan a workshop which elaborates on future scenarios produced by the technologies in rural and agricultural communities. It helps to identify the main drivers of change and uncertainties and allows participants to think radically. The Workshop also has a more visual mobile version on YouTube: Scenario Planning step by step - YouTube

## ii. Scenario Question & timeframe

What will crofting communities be like in 2031 given future digitalisation?

The Scottish team's SQ

You should already have a Scenario Question including 2031 as the future horizon.

## iii. Review past events

This task will already have been completed in WP2 'Assessing Past and Present Impact.

A timeline (as illustrated) is a good way to share the review with the scenario planners at the beginning of the scenario workshop sessions.

iv. Identify drivers of Change (DOC) that are Critical Uncertainties

This step will be completed by the LL research team BEFORE the 2 scenario workshop sessions.

A reminder of the STEEP approach

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## STEEP

| STEEP | | DOC |
|---|---|---|
| | | Demographic issues? Depopulation? Digital literacy? Local community issues? Cooperation? Stakeholders and their technology adoption? SCP? |
| | | What are the relevant Digital Game Changers? Data? Information flow? Platforms? Solutions? Infrastructure? SCP? Equipment? Production methods? |
| | | Sustainability? Land management? Climate Emergency? Natural environment? |
| | | Macroeconomic environment? Local economy? Markets? Labour force? |
| | | Types of governance? Extent of future governmental support? Local norms and values? Institutions? Formal and informal interactions between stakeholders? |

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## iv. Identify Critical Uncertainties

| STEEP | DOC |
|-------|-----|
| S | **e.g.** Digital gender divide |
| T | e.g. **1.** Connectivity in the rural area: **2.** Digital training platforms |
| E | e.g. 1. Ecommerce: 2. Diversification /pluractivity |
| E | e.g. Rewilding, Native Restoration, Living Landscape |
| P | e.g. Crofting Arrangements inc. subsidies |
| X | **Include an additional driver if you think it is necessary** |

The process is flexible – another STEEP driver may be helpful e.g. an additional 'T'. Remember that more drivers mean more participatory discussion and more complexity for participants – so NOT TOO MANY.

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## iv. Identify Critical Uncertainties

| STEEP DOC |
|-----------|
| Digital gender divide |
| Connectivity in the rural area & Digital training platforms |
| Ecommerce supporting diversification/ pluractivity |
| Rewilding, Native Restoration, Living Landscape |
| Crofting support mechanisms |
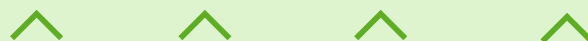
The DOC becomes the first column in the Morphological Box

The other columns will be the different assumptions about how these drivers will shape the future

Choose between two & four assumptions for each DOC
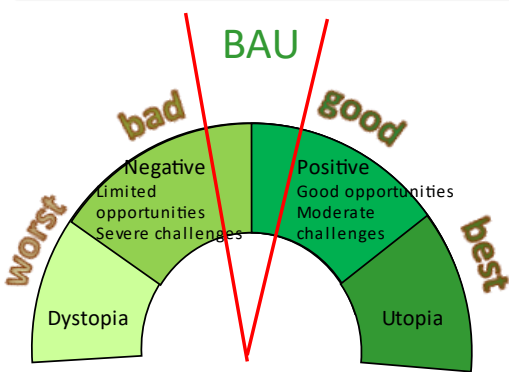
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## Slide 11



Intermediate scenarios will be developed in detail

bad • good

**Negative**
Limited opportunities
Severe challenges

**Positive**
Good opportunities
Moderate challenges

worst • best

Dystopia • Utopia

Extreme scenarios will be developed in outline only

History suggests that best and worst cases are less likely to occur than mixed scenarios with some winners and some losers.

Assumptions explore how the DOC may plausibly affect the future. We will to develop two future narratives: one in which digitalisation leads to a better but not best case scenario; and another narrative in which it leads to a worse but not worst case scenario.

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## Slide 12

bad good
worst

**What is good?**

BAU



bad • good

**Negative**
Limited opportunities
Severe challenges

**Positive**
Good opportunities
Moderate challenges

worst • best

Dystopia • Utopia

It can be a helpful reference point to think of BAU as a point of departure – bad being worse than BAU and good being better than BAU.

The overarching goal of DESIRA is to improve the capacity of society and of political bodies to respond sustainably to the challenges that digitisation generates in rural areas, agriculture and forestry in the next ten years.

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## iv. Identify Critical Uncertainties

| STEEP DOC | Assumption 1 | Assumption 2 - BAU | Assumption 3 | Assumption 4 |
|---|---|---|---|---|
| Digital gender divide | | | | |
| Connectivity in the rural area &Digital training platforms | Connectivity is **HIGH**, favourably comparable with UK urban areas with 7G and 8G services available. Digital training platforms are widely adopted. | Connectivity is **MODERATE**, service provision lagging behind urban areas. 6G is the typical service provision for this area. Adoption of Digital training platforms is limited. | Connectivity is **POOR** 4G and 5G services limit both opportunities for rural businesses and availability of services in this area. Digital training platforms are rare. | |
| Ecommerce supporting diversification/ pluractivity | ︿ | ︿ | ︿ | |
| Rewilding, Native Restoration, Living Landscape | *Assumptions can take the form High/Medium/Low* | | | |
| Crofting support mechanisms | | | | |

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| STEEP DOC | Assumption 1 | Assumption 2 - BAU | Assumption 3 | Assumption 4 |
|---|---|---|---|---|
| Digital gender divide | | | | |
| Connectivity in the rural area & Digital training platforms | Connectivity is HIGH, favourably comparable with UK urban areas with 7G and 8G services available. Digital training platforms are widely adopted. | Connectivity is MODERATE, service provisionlagging behind urban areas. 6G is the typical service provision for this area. Adoption of Digital training platforms is limited. | Connectivity is POOR 4G and 5G services limit both opportunities for rural businesses and availability of services in this area. Digital training platforms are rare. | |
| **Ecommerce supporting diversification / pluriactivity** | Ecommerce platforms are providing a lucrative market for croft based enterprises. | Ecommerce provides a modest market for croft based enterprises supplementing other incomes. | Ecommerce is a weak driver for croft based enterprises. | Ecommerce platforms are dominated by larger players and act to exclude croft based enterprises. |
| Rewilding, Native Restoration, Living Landscape | ︿ | ︿ | ︿ | ︿ |
| Crofting support mechanisms | *Up to 4 assumptions can made for any driver* | | | |

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**Slide 15**

| STEEP DOC | Assumption 1 | Assumption 2 - BAU | Assumption 3 | Assumption 4 |
|---|---|---|---|---|
| Digital gender divide | | | | |
| Connectivity in the rural area & Digital training platforms | Connectivity is HIGH, favourably comparable with UK urban areas with 7G and 8G services available. Digital training platforms are widely adopted. | Connectivity is MODERATE, service provision lagging behind urban areas. 6G is the typical service provision for this area. Adoption of Digital training platforms is limited. | Connectivity is POOR 4G and 5G services limit both opportunities for rural businesses and availability of services in this area. Digital training platforms are rare. | |
| Ecommerce supporting diversification/ pluractivity | Ecommerce platforms are providing a lucrative market for croft based enterprises. | Ecommerce provides a modest market for croft based enterprises supplementing other incomes. | Ecommerce is a weak driver for croft based enterprises. | Ecommerce platforms are dominated by larger players and act to exclude croft based enterprises. |
| Rewilding, Native Restoration, Living Landscape | Under a strong Green Recovery, Rewilding and high valuation around Living Landscapes benefits crofting | Under a modest Green Recovery, crofting continues to make moderate progress | Without effective Green Recovery crofting declines | Green Recovery promotes rewilding over Living Landscapes to the detriment of traditional crofting |
| Crofting support mechanisms | | | | |
| | | | | |

**Make assumptions for all drivers**

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**Slide 16**

| STEEP DOC | Assumption 1 | Assumption 2 - BAU | Assumption 3 | Assumption 4 |
|---|---|---|---|---|
| Digital gender divide | | | | |
| Connectivity in the rural area & Digital training platforms | Connectivity is HIGH, favourably comparable with UK urban areas with 7G and 8G services available. Digital training platforms are widely adopted. | Connectivity is MODERATE, service provision lagging behind urban areas. 6G is the typical service provision for this area. Adoption of Digital training platforms is limited. | Connectivity is POOR 4G and 5G services limit both opportunities for rural businesses and availability of services in this area. Digital training platforms are rare. | |
| Ecommerce supporting diversification/ pluractivity | Ecommerce platforms are providing a lucrative market for croft based enterprises. | Ecommerce provides a modest market for croft based enterprises supplementing other incomes. | Ecommerce is a weak driver for croft based enterprises. | Ecommerce platforms are dominated by larger players and act to exclude croft based enterprises. |
| Restoration, Living Landscape | Rewilding and high valuation around Living Landscapes benefits crofting | crofting continues to make moderate progress | fective Green Recovery crofting declines | Green Recovery promotes rewilding over Living Landscapes to the detriment of traditional crofting |
| Crofting support mechanisms | Strong public support is available for crofting inc. payments that safeguard livelihoods | Weak public support for crofting does little to safeguard livelihoods | | |

**A DOC may only have 2 assumptions**

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**DESIRA**

| STEEP DOC | Assumption 1 | Assumption 2 – BAU | Assumption 3 | Assumption 4 |
|---|---|---|---|---|
| Digital gender divide | Gap is narrowed. Affirmative action and effective women in STEM policies have created a more level 'digital' playing field. | Gender Gap remains. There are fewer digital opportunities for women. Women have lower levels of technology skills and are paid less in STEM field. | Gap is widening due to post Covid austerity. GiG economy and lack of effective action around women in STEM have worsened outcomes. | |
| Connectivity in the rural area & Digital training platforms | | | | |
| Ecommerce supporting diversification/ pluractivity | | | | |
| Rewilding, Native Restoration, Living Landscape | | | | |
| Crofting support mechanisms | | | | |

*Your completed Morphological Box will look similar to this example*

*The next task is to build scenario outlines by selecting two combinations of assumptions or future frames within the MB*

*One Scenario Outline will represent a scenario that is better than BAU but not the best possible case*

*The other Scenario Outline will represent a scenario that is worse than BAU but not the worst possible case*

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**DESIRA**

| STEEP DOC | Assumption 1 | Assumption 2 – BAU | Assumption 3 | Assumption 4 |
|---|---|---|---|---|
| Digital gender divide | Gap is narrowed. Affirmative action and effective women in STEM policies have created a more level 'digital' playing field. | Gender Gap remains. There are fewer digital opportunities for women. Women have lower levels of technology skills and are paid less in STEM field. | Gap is widening due to post Covid | |
| Connectivity in the rural area & Digital training platforms | Connectivity is HIGH, favourably comparable with UK urban areas with 7G and 8G services available. Digital training platforms are widely adopted. | Connectivity in this area. Adoption of Digital training platforms is limited. | availability of services in this area. Digital training platforms are rare. | |
| Ecommerce supporting diversification/ pluractivity | Ecommerce platforms are providing a lucrative market for croft based enterprises. | Ecommerce provides a modest market for croft based enterprises supplementing other incomes. | Ecommerce is a weak driver for croft based enterprises. | Ecommerce platforms are dominated by larger players and act to exclude croft based enterprises. |
| Rewilding, Native Restoration, Living Landscape | Under a strong Green Recovery, Rewilding and high valuation around Living Landscapes benefits crofting | Under a modest Green Recovery, crofting continues to make moderate progress | Without effective Green Recovery crofting declines | Green Recovery promotes rewilding over Living Landscapes to the detriment of traditional crofting |
| Crofting support mechanisms | Strong public support is available for crofting inc. payments that safeguard livelihoods | Weak public support for crofting does little to safeguard livelihoods | | |

*This BLUE scenario outline in the MB represents a better than BAU future frame.*

*It is important to combine assumptions that the stakeholders find plausible and consistent.*

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## Slide 19

| STEEP DOC | Assumption 1 | Assumption 2 – BAU | Assumption 3 | Assumption 4 |
|---|---|---|---|---|
| Digital gender divide | Gap is narrowed. Affirmative action and effective women in STEM policies have created a more level 'digital' playing field. | Gender Gap remains. There are fewer digital opportunities for women. Women have lower levels of technology skills and are paid less in STEM fields. | Gap is widening due to post Covid austerity. GiG economy and lack of effective action around women in STEM have worsened outcomes. | |
| Con... are... pla... | | Connectivity is MODERATE, service provision lagging behind urban areas. 6G is the typical service provision for this area. Adoption of Digital training platforms is limited. | Connectivity is POOR 4G and 5G services limit both opportunities for rural businesses and availability of services in this area. Digital training platforms are rare. | |
| Ecc... div... plu... | | Ecommerce provides a modest market for croft based enterprises supplementing other incomes. | Ecommerce is a weak driver for croft based enterprises. | Ecommerce platforms are dominated by larger players and act to exclude croft based enterprises. |
| Rewilding, Native Restoration, Living Landscape | Under a strong Green Recovery, Rewilding and high valuation around Living Landscapes benefits crofting | Under a modest Green Recove... crofting continues to make m... progress | | |
| Crofting support mechanisms | Strong public support is available for crofting inc. payments that safeguard livelihoods | Weak public support for crof... does little to safeguard liveli... | | |

*The PINK scenario outline represents a WORSE than BAU future but not the worst case scenario.*

*Two assumptions are selected for this DOC. This is allowed if this is plausible and consistent with other assumptions.*

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## Slide 20

| STEEP DOC | Assumption 1 | Assumption 2 BAU | Assumption 3 | Assumption 4 |
|---|---|---|---|---|
| Digital gender divide | Gap is narrowed. Affirmative action and effective women in STEM policies have created a more level 'digital' playing field. | Gender Gap remains. There are fewer digital opportunities for women. Women have lower levels of technology skills and are paid less in STEM fields. | Gap is widening due to post Covid austerity. GiG economy and lack of effective action around women in STEM have worsened outcomes. | |
| Connectivity in the rural area & Digital training platforms | Connectivity is HIGH, favourably comparable with UK urban areas with 7G and 8G services available. Digital training platforms are widely adopted. | Connectivity is MODERATE, service provision lagging behind urban areas. 6G is the typical service provision for this area. Adoption of Digital training platforms is limited. | Connectivity is POOR 4G and 5G services limit both opportunities for rural businesses and availability of services in this area. Digital training platforms are rare. | |
| Ecommerce supporting diversification/ pluractivity | Ecommerce platforms are providing a lucrative market for croft based enterprises. | Ecommerce provides a modest market for croft based enterprises supplementing other incomes. | Ecommerce is a weak driver for croft based enterprises. | Ecommerce platforms are dominated by larger players and act to exclude croft based enterprises. |
| Rewilding Native Restoration, Living Landscape | Under a strong Green Recovery, Rewilding and high valuation around Living Landscapes benefits crofting | Under a modest Green Recovery, crofting continues to make moderate progress | Without effective Green Recovery crofting declines | Green Recovery promotes rewilding over Living Landscapes to the detriment of traditional crofting |
| Crofting support mechanisms | Strong public support is available for crofting inc. payments that safeguard livelihoods | Weak public support for crofting does little to safeguard livelihoods | | |

*You now have your two scenario outlines.*
*These outlines will be used in the 2 workshop sessions to build narrative scenarios.*

*If you have 12 or more participants, you have the option to develop a 3d BAU scenario in a 3d breakout group.*

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## Scenario planning workshop

We suggest holding two sessions of equal duration that can be on the same day or on separate days. You can decide.

You have now pre-prepared all the materials you will need for the workshops.
6 hours will be needed to develop scenarios and consider implications.

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## The Scenario planning workshops

i. Recruit scenario planners

ii. Draft Scenario Question & determine timeframe

iii. Review past events

iv. Identify critical uncertainties

v. Develop plausible scenarios

vi. Consider implications

You are now at the first workshop session.
You will have:
- scenario planners
- A scenario question
- Two scenario outlines

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## The Scenario planning workshops

Workshop activities are fully documented in a separate workshop guide with time estimates for each element

## Session 1

What will crofting communities be like in 2031 given future digitalisation?
The Scottish team's SQ

You will need to introduce and explain your Scenario Question

Session 1

Reviewing past events can be a good ice-breaker. It will emphasise how radically things can change over a 10 year period and will help the scenario planers to think radically.

---

Session 1

| STEEP DOC | Assumption 1 | Assumption 2- BAU | Assumption 3 | Assumption 4 |
|---|---|---|---|---|
| Digital gender divide | Gap is narrowed. Affirmative action and effective women in STEM policies have created a more level 'digital' playing field. | Gender Gap remains. There are fewer digital opportunities for women. Women have lower levels of technology skills and are paid less in STEM fields. | Gap is widening due to post Covid austerity. GiG economy and lack of effective action around women in STEM have worsened outcomes. | |
| Connectivity in the rural area & Digital training platforms | Connectivity is HIGH, favourably comparable with UK urban areas with 7G and 8G services available. Digital training platforms are widely adopted. | Connectivity is MODERATE, service provision lagging behind urban areas. 6G is the typical service provision for this area. Adoption of Digital training platforms is limited. | Connectivity is POOR 4G and 5G services limit both opportunities for rural businesses and availability of services in this area. Digital training platforms are rare. | |
| Ecommerce supporting diversification/ pluractivity | Ecommerce platforms are providing a lucrative market for croft based enterprises. | Ecommerce provides a modest market for croft based enterprises supplementing other incomes. | Ecommerce is a weak driver for croft based enterprises. | Ecommerce platforms are dominated by larger players and act to exclude croft based enterprises. |
| Rewilding Native Restoration, Living Landscape | Under a strong Green Recovery, Rewilding and high valuation around Living Landscapes benefits crofting | Under a modest Green Recovery, crofting continues to make moderate progress | Without effective Green Recovery crofting declines | Green Recovery promotes rewilding over Living Landscapes to the detriment of traditional crofting |
| Crofting support mechanisms | Strong public support is available for crofting inc. payments that safeguard livelihoods | Weak public support for crofting does little to safeguard livelihoods | | |

Divide the scenario planners into 2 groups.
One group will develop *your* better NOT best scenario outline (blue).
The other group will develop *your* worse NOT worst outline (pink).

## Slide 27

# Scenario Development Checklist

- Ground-truth assumptions
- Consider SCPS in 2031
- How do the assumptions combine to influence the SCPS?
- Who are the winners and losers?
- What are the challenges and opportunities?
- What uncertainties are present?
- What predetermined elements exert influence?
- Add detail and colour to the scenario– what is it like to live in this version of the future?

## Slide 28

### Session 1

| STEEP DOC | Assumption 1 | Assumption 2- BAU | Assumption 3 | Assumption 4 |
|---|---|---|---|---|
| Digital gender divide | Gap is narrowed. Affirmative action and effective women in STEM policies have created a more level 'digital' playing field. | Gender Gap remains. There are fewer digital opportunities for women. Women have lower levels of technology skills and are paid less in STEM fields. | Gap is widening due to post Covid austerity. GIG economy and lack of effective action around women in STEM have worsened outcomes. | |
| Connectivity in the rural area & Digital training platforms | Connectivity is HIGH, favourably comparable with UK urban areas with 7G and 8G services available. Digital training platforms are widely adopted. | Connectivity is MODERATE, service provision lagging behind urban areas. 6G is the typical service provision for this area. Adoption of Digital training platforms is limited. | Connectivity is POOR 4G and 5G services limit both opportunities for rural businesses and availability of services in this area. Digital training platforms are rare. | |
| Ecommerce supporting diversification/ pluractivity | Ecommerce platforms are providing a lucrative market for croft based enterprises. | Ecommerce provides a modest market for croft based enterprises supplementing other incomes. | Ecommerce is a weak driver for croft based enterprises. | Ecommerce platforms are dominated by larger players and act to exclude croft based enterprises. |
| Rewilding Native Restoration, Living Landscape | Under a strong Green Recovery, Rewilding and high valuation around Living Landscapes benefits crofting | Under a modest Green Recovery, crofting continues to make moderate progress | Without effective Green Recovery crofting declines | Green Recovery promotes rewilding over Living Landscapes to the detriment of traditional crofting |
| Crofting support mechanisms | Strong public support is available for crofting inc. payments that safeguard livelihoods | Weak public support for crofting does little to safeguard livelihoods | | |

For the exercise to succeed the scenario planners must
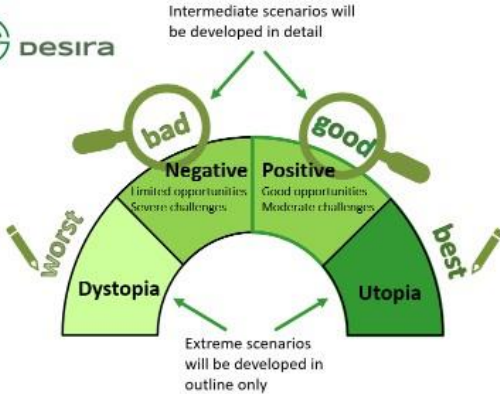
Scenario planners need to consider:

Is each assumption plausible?

Is the set of assumptions coherent?

Is there a better assumption that will help to explore the SCPS?

scenario development but is a good place to start.

## Session 1



Intermediate scenarios will be developed in detail

bad | good

**Negative** | **Positive**
Limited opportunities | Good opportunities
Severe challenges | Moderate challenges

worst | best

Dystopia | Utopia

Extreme scenarios will be developed in outline only

History suggests that best and worst cases are less likely to occur than mixed scenarios with some winners and some losers.

Developing the scenario means creating a plausible narrative in which the assumptions you have made have come true. The narrative will contain details of the Social Cyber Physical System – 'what is your SCPS like in 2031'. Scenario planners will work together to describe this future world including its challenges and opportunities.

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## Session 1



The LL research team will capture as much information as possible to convert the discussions into draft scenario narratives for the next session

Once both breakout groups have sketched-out their scenarios they will present the main features to the whole group. A Q&A and a cross comparison will help to shape the scenarios further in plenary.

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## Between the two sessions
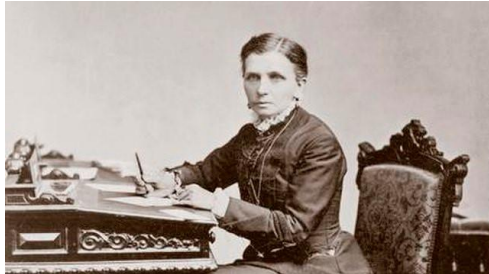
If both sessions are planned in the same day it is possible to simply give a short summary of each scenario

Using the notes and recordings from session 1 the research team will create a short presentation of both the blue and pink scenarios.

You can use bullet points, images and diagrams as necessary.

You can get feedback on the draft narratives or elements of them with your stakeholders if time allows

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## Session 2

Different techniques can be effective.
A timeline can be created using pen and paper or MIRO. The participants can be asked to suggest milestones along the way to their particular 2031.

pesentation both scenario narratives two groups will reconvene

Participants can be asked to suggest headlines that illustrate different events leading up to their future.

BUILDING O

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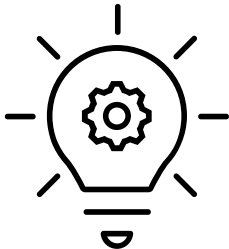
## Session 2

Breakout groups will be asked to suggest policies or ideas that, if implemented now, will better prepare us to take advantage of future opportunities and mitigate risks described in the scenario.

Suggestions must be relevant to the SCPS.

Try to capture 3-4 policies or ideas.
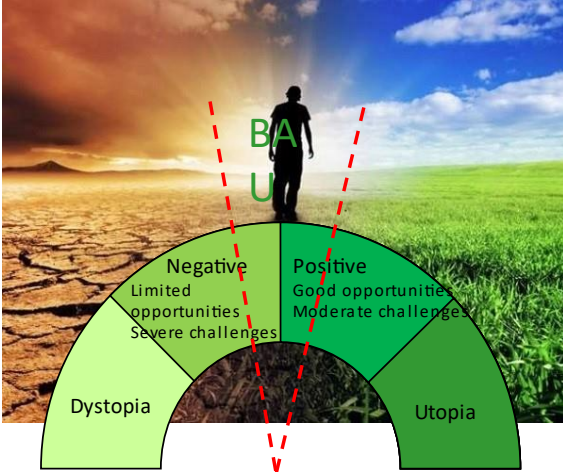
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## Session 2 – Heaven & Hell

WORST CASE SCENARIO

BEST CASE SCENARIO

Negative
Limited opportunities
Severe challenges

Positive
Good opportunities
Moderate challenges

Dystopia

Utopia

BAU

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**Session 2**

Windtunnelling

In plenary both groups should consider whether the policies and ideas from the other group would be effective within their scenario.

Windtunnelling is a technique designed to stress test different scenario parameters.

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**Session 2**

Figure 6 – Living Labs' scenario development
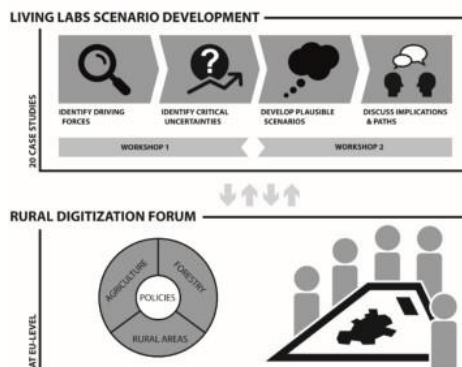
At the end of the second session you should have captured all the material required to complete the scenario planning template and finalise two scenario narratives.

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# WP4: Policy Roadmap and Ethical Code

The EU has prioritised digitisation and the Digital Union, recognising the potential impacts and challenges of these technologies in rural areas. However, there is a lack of comprehensive analysis of the legal and policy frameworks in different countries, and guidelines are needed to inform future policy decisions at national and EU levels. The objective of WP4 is to propose a Policy Roadmap that addresses policy gaps and aligns digitisation with societal needs, integrating the RRI approach and Sustainable Development Goals. The specific objectives include assessing existing policy frameworks, highlighting gaps, developing an ethical code, and creating a Policy Roadmap.

## National Policy Analysis



DESIRA

DIGITISATION: ECONOMIC AND SOCIAL IMPACTS IN RURAL AREAS

**National Policy Analysis**

Mar Delgado & Sara Sánchez, University of Córdoba, Spain

17th May 2021

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#DESIRA2020

## Outline



- Introduction
- Context for (rural) digitalisation
- Policy framework for (rural) digitalisation
- Challenges and opportunities
- Conclusions

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## 1. Introduction

The policy scenario is mainly shaped by **two types of policies:**

1. Digitalisation and digital transition policies that affects agriculture, forestry and rural areas
2. Rural and agricultural policies that foster digitalization

Please refer to **DESIRA RDF Briefing on principles for sustainable digitalisation** to guide the analysis



**EXPERTS' RECOMMENDATIONS TO BOOST SUSTAINABLE DIGITALISATION OF AGRICULTURE, FORESTRY AND RURAL AREAS BY 2040**

February 2021

Author(s): Gianluca Brunori (University of Pisa), Enrique Nieto (AEIDL), Blanca Casares (AEIDL), Lies Debruyne (ILVO), Talis Tisenkopfs (Baltic Studies Centre), Antonio Brunori (PEFC Italy)

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## 2. Context for (rural) digitalisation

**Key Questions**

*Note: Follow the links from the examples. to the websites.*

- What is the current situation of the digitalisation process in your country?
- How many people or what percentage of population has access to broadband?
- What percentage of the territory has connectivity?
- Main differences of connectivity/use of digital tools/access to digital services between rural and urban areas?
- Has the digital divide been analysed and/or addressed?
- Are there age or gender differences, both in general and in the rural areas?



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## 3. Policy framework for (rural) digitalisation

3.1. **European Digital Policies**
3.2. **National Policies boosting digitalization**
    3.2.1.    National Digital Agenda or similar strategies
    3.2.2.    Other policies and strategies influencing (rural) digitalisation
    3.2.3.    Policies and strategies to boost digital literacy and tackle the digital divide
    3.2.4.    Policies and strategies that incentivise digital innovations
3.3. **Contributions from the Structural and Investment Funds and the Cohesion Policy**
    3.3.1.    Broadband infrastructure
    3.3.2.    Digital Public Services
    3.3.3.    Research and Innovation Strategies for Smart Specialization (RIS3)
    3.3.4.    Digital Innovation Centres (DIH)
3.4. **CAP National Strategic Plans**
    3.4.1.    CAP Integrated Administration and Control System (IACS)
3.5. **Data management**

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## 3. Policy framework for (rural) digitalisation

### 3.1 European Digital Policies

Please try to analyse how the EU policies with focus on digitalisation are influencing digital transition in rural areas of your countries (national buy-in, budget, impact, barriers and so on)

### 3.2 National Policies boosting digitalization

This section will gather the different existing at national policies promoted by different ministries and institutions.

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## 3. Policy framework for (rural) digitalisation

### 3.2 National Policies boosting digitalization

3.2.1. National Digital Agenda or similar strategies

Provide information on the following aspects:

- Is there a national digital agenda/strategy in your country?

- When was it approved?

- Is there any budget allocated to support it?

- Does it address particularly rural areas? If so, how?

*Please look at the example given in the Guidelines

Fig 1. Digital Spain 2025 Agenda

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## 3. Policy framework for (rural) digitalisation

### 3.2 National Policies boosting digitalization

3.2.2. Other policies and strategies influencing (rural) digitalisation

- National policies launched by different Ministries in your country

- Identify these policies and describe how they influence agriculture, forestry, and rural areas

- Identify their influence in rural areas or if they do not, the reasons behind this fact

- Please use the following table format to summarise the information

**Table XX:** National Policies

| Ministry/Authority | Policy | Objective | Expected impact |
|---|---|---|---|
| | | | |
| | | | |

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## 3. Policy framework for (rural) digitalisation

### 3.2 National Policies boosting digitalization

3.2.3. Policies and strategies to boost digital literacy and tackle the digital divide

Describe them and populate Table AA summarising is main characteristic and its influence in rural areas

**Table AA:** Programmes and initiatives addressing digital literacy and digital divide

| Initiative | Objective | Key words | Period | Area of impact | Link | Public/ Private | Scale of action | Rural/ General |
|---|---|---|---|---|---|---|---|---|
| Reportero Escolar | Increasing skills in the use of new technologies and digital tools | Digital diary, audiovisual report video | 2018-2019 | La Rioja, Spain | http://reporteroesc olar.unir.net/2019/ | Private | Regional | G |
| Digital Schools Award | To provide education professionals with the resources and support required to help pupils safely navigate the digital world | cyberbullying, social networking, schools | 2018-2019 | Scotland, Norther Ireland, Ireland | https://www.digital schoolsawards.co.u k/ | Public | Internatio nal | G |

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## 3. Policy framework for (rural) digitalisation
### 3.2 National Policies boosting digitalization

3.2.4 Policies and strategies that incentivize digital innovations

- Initiatives fostering the creation of digital innovation ecosystems in or with influence in rural areas

- Initiatives boosting new digital business models in rural areas, agriculture, and forestry

- UE Smart villages Action

- Initiatives develop by EIP- Agri initiatives

  Please, specify if the policies are national or regional.

| Initiative | Brief Description | Objectives | Area of impact | Period of implementation | Budget (if any) | Public / Private | Are rural areas specifically mentioned or addressed? Y/N | Link |
|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |

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## 3. Policy framework for (rural) digitalisation
### 3.3 Contributions from the Structural and Investment Funds and the Cohesion Policy

3.3.1 Broadband infrastructure

3.3.2 Digital Public Services

- e-administration procedures
- e-health
- e-education
- Digital identity
- Digital signature
- On-line banking (transferences, payments)
- Bills (council taxes, water, electricity)
- Others
- You can use your own knowledge and perception.

**Table XX:** Digital Public Services usage

| | | Extremely common | Very common | Fairly common | Not common for most of the population | It is not a possibility nowadays |
|---|---|---|---|---|---|---|
| e-Administration procedures | In general in the country |  |  |  | X |  |
| | In rural areas |  |  |  | X |  |
| e-Health | In general in the country |  |  | X |  |  |
| | In rural areas |  |  |  | X |  |
| e-Education | In general in the country |  |  |  |  |  |
| | In rural areas |  |  |  |  |  |
| Digital identity | In general in the country |  |  |  |  |  |
| | In rural areas |  |  |  |  |  |
| Digital signature | In general in the country |  |  |  |  |  |
| | In rural areas |  |  |  |  |  |
| On-line banking (account management, payments) | In general in the country |  | X |  |  |  |
| | In rural areas |  |  | X |  |  |
| Bills (council taxes, water, electricity) | In general in the country | X |  |  |  |  |
| | In rural areas | X |  |  |  |  |

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# 3. Policy framework for (rural) digitalisation

## 3.3 Contributions from the Structural and Investment Funds and the Cohesion Policy

### 3.3.2 Research and Innovation Strategies for Smart Specialization (RIS3)

Identify how present (if available) or past RIS3 boost rural digitalisation

### 3.3.3 Digital Innovation Centres (DIH)

- The H2020 project SmartAgriHubs is a good starting point

When possible, try to answer the following questions: how do they reach rural areas, agriculture and forestry? Who are the main actors engaged? Do they support small-scale actions, municipalities, SMEs, etc?

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# 3. Policy framework for (rural) digitalisation

## 3.4. CAP National Strategic Plans

Please, describe how digitalisation have been addressed in the latest version existing in your country in the National Strategic Plans under CAP.

Use information from the SHERPA project by looking into your country
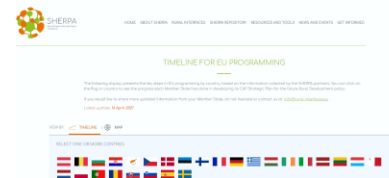


### 3.4.1. CAP Integrated Administration and Control System (IACS)

Identify if your country is using digital instruments to monitor the CAP funds perceived by farmers or participating in any of the pilot launched by the EC

Fig 2. SHERPA display "Timing EU Programming". Source: SHERPA website

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# 3. Policy framework for (rural) digitalisation

## 3.5. Data Management

Describe any action or framework existing in your country that address the issues of regulation of data, data federations, harmonization of access, and reliability of data with a special focus in their influence in rural areas

**Indicate if there is no specific initiative at country level besides just following/implementing the EU policies**

Analise the following areas:

• **Open Data**

> Please analyse how Directive (EU) 2019/1024 has been implemented in your country.
>
> Some examples of open data portals are given in the Guidelines

• **Cybersecurity**

• **Interoperability**

---

# 4. Challenges and Opportunities

## 4.1 Barriers to digitalisation

• Besides other barriers, mention, if possible the influence of COVID 19 (positive/negative)

• Use the following table to summarise

**Table XX**: Barriers to digitalisation

| Barriers to digitalisation | | Influence of COVID-19 |
|---|---|---|
| Technical | Low interoperability of services and information | |
| | Low connectivity in rural areas | |
| Legal | Conflict over data ownership and profitability | |
| | | |
| Training / Education | Lack of digital skills | |
| | | |
| Economic | Lack of evidence of return on investment | |
| | Limited development of telework | |
| Others | Lack of public data to enable the development of digital business models | |

## 4. Challenges and Opportunities

### 4.2 Actions to boost sustainable digitalisation

- Base on the principles identified by

  DESIRA RDF briefing

- Fill in the table with ideas of actions

Table XX: Actions to boost sustainable digitalisation

| | Key rural development domains | | | |
|---|---|---|---|---|
| | Human capital | Innovation | Investments | Governance |
| Creating the basic conditions for digitalisation | | | | |
| Anchoring digitalisation to sustainable development | | | | |
| Adapting digitalisation to different context | | | | |
| Favouring digital inclusion | Mapping vulnerable groups | Encouraging peer-to-peer networking | Support to vulnerable groups | Monitoring DESI indicators progress |
| Developing digital ecosystems | | | | |
| Developing adaptative governance models | | | | |
| Designing policy tools for sustainable digitalisation | | | | |

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## 5. Conclusions

- Overview of the situation of rural digitalisation in your country.
- Main policies influencing rural digitalisation.
- Main challenges faced at policy level in your country for rural digitalisation.
- Policies/strategies that achieved a bigger impact in the rural digitalisation.
- Policies/strategies that did not generated the expected impact and the reasons behind.
- Main recommendations of the report

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# ETHICAL CODE

**DESIRA**

DIGITISATION: ECONOMIC AND SOCIAL IMPACTS IN RURAL AREAS

## The DESIRA ethical code

#DESIRA2020

## Why an ethical code?

Digital technologies have the potential to bring significant benefits to society, but they also have the potential to cause harm if they are not developed and used in an ethical manner.

Ethical considerations are important in digital innovations because they help to ensure that the development and use of technology respect the rights and values of all individuals affected by it.

Difference between ethical framework – ethical code – code of conduct

Difference between ethical and legal ("*While many of the ethical requirements are backed by legal requirements, ethical compliance cannot be achieved by adhering to legal obligations alone.*")

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## Why an ethical code

The construct of an ethical framework provides an accessible approach for designers to engage with ethical issues in need of attention

Not meant as a stand-alone checklist, but rather a starting point for ethical reflection in technology development, and as such is to be considered as an applied ethics tool, intended to structure concerns and opportunities that designers and implementers should pay attention to, and work to mitigate or enhance, respectively, when possible.

## Elements shaping the DESIRA ethical code

1. Conceptual foundation of DESIRA: RRI framework

2. Other approaches and methodologies: ethics by design, value sensitive design

3. Existing ethical codes, frameworks and guidelines around digitalisation

4. Empirical results (mostly from the Living Labs)

# 1. RRI framework

RRI aims for creating innovations that reflect societal values at large, rather than only values of a particular interest group or market actor

As such, RI has both a **process** dimension and **product** dimension: i.e. the implementation of the right procedural aspects in innovation (inclusion, reflexivity, anticipation and responsiveness), leads with higher probability to more sustainable and socially robust and desirable innovations (von Schomberg, 2013; Van de Poel and Sand, 2018)

Three emerging features of RRI (Owen et al., 2012): science for society, science with society, reframing responsibility: link to virtue ethics (papers of Grinbaum and Groves, 2013; Steen et al., 2021)

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# Virtue ethics in relation to Responsible Innovation

Several authors (Grinbaum & Groves, 2013; Steen et al., 2021) advocate for virtue ethics as a relevant ethical theory in support of RI (as opposed to consequentialism and deontologism)

Theories of "the right" (consequentialism – deontology), which mostly lead to obligations (e.g. you cannot steal) vs. theories of "the good" (virtue ethics), which is more considered as discretionary (e.g. be charitable) (Friedman & Kahn, xx)

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## Virtue ethics in relation to Responsible Innovation

Focus on the agents involved in the innovation process (Steen et al., 2021)
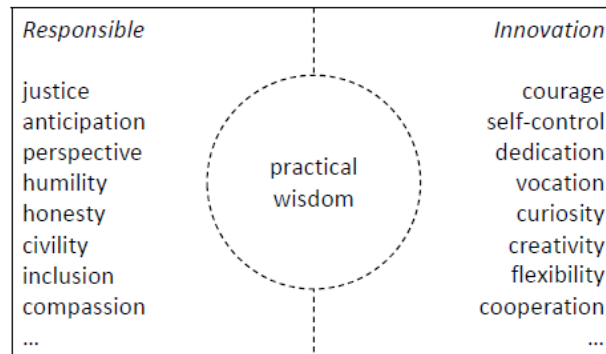
| Responsible | | Innovation |
|---|---|---|
| justice | | courage |
| anticipation | | self-control |
| perspective | | dedication |
| humility | practical | vocation |
| honesty | wisdom | curiosity |
| civility | | creativity |
| inclusion | | flexibility |
| compassion | | cooperation |
| ... | | ... |

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## Virtue ethics in relation to RRI

Virtues can be developed and trained, but not by reading books, rather through action and practice (making mistakes and learning from them). Importance of narratives, stories, moral examples, vignettes, …

Metaphor: virtue ethics as a road map

Recommendations on how individuals should behave themselves/act in innovation processes

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## Value sensitive design

Emerged in the 1990s, term first coined in 1996 by Friedman

"Value Sensitive Design positions all those working at the intersection of technology and society to make insightful investigations into technological innovation in ways that foreground the well-being of human beings and the natural world"

Values: "what is important to people in their lives , with a focus on ethics and morality". Includes elements like human well-being, dignity and justice

Key proposition: relationship between technology and human values is fundamentally interactional

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## Value sensitive design

It provides theory, method and practice to account for human values in a principled and systematic manner throughout the technical design process, therefore influencing the design of technology early in and throughout the design process

Core set of theoretical commitments: interactional stance; analyses of both direct and indirect stakeholders; distinctions among explicitly stated project values, designer values and stakeholder values; individual, group and societal levels of analysis; integrative and iterative conceptual, technical and empirical investigations; co-evolution of technology and social structure; progress, not perfection

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# Which values matter?

Friedman et al., 2006: List of 13 human values with ethical import often implicated in system design (human welfare, ownership and property, privacy, freedom from bias, universal usability, trust, autonomy, informed consent, accountability, courtesy, identity, calmness, environmental sustainability)

Not proposed as a comprehensive list, and while there is a concern that such a list could lead to a reification of this specific set of values, there is also a need to build upon prior work

Open question: how to account for non-human values?

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# Ethics by design

More recent approach (first papers in 2018), emerged from a group of methods and approaches that seek to ensure ethical thinking permeates science and technology at every stage of design and development (see also VSD, RRI, …)

aims to incorporate ethical considerations into every stage of a technology's life cycle, from its design to its development and implementation, in order to mitigate possible negative ethical consequences produced by the technology.

Focused specifically on AI systems, adopted by the EC in the form of a guidance note ("Ethics by design and ethics of use approaches for artificial intelligence, 2021)

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# Which ethical principles?

Six general ethical principles, based on the Charter of Fundamental Rights of the European Union, and in relevant international human rights law:

> Respect for human agency (which includes autonomy, dignity and freedom)

> Privacy and data governance

> Fairness

> Individual, social and environmental well-being

> Transparency

> Accountability and oversight

All of these principles, have also been translated in a number of ethical requirements for AI systems

**Assessing the socio-economic impact of digitalisation in rural areas**

# Considerations for the DESIRA ethical code

Digitalisation in agriculture, forestry and rural areas

Which key values and ethical principles?

How can such an ethical framework (which is largely conceptual/philosophical) be translated in something which is more operational and practical (which is our aim) → values hierarchy framework

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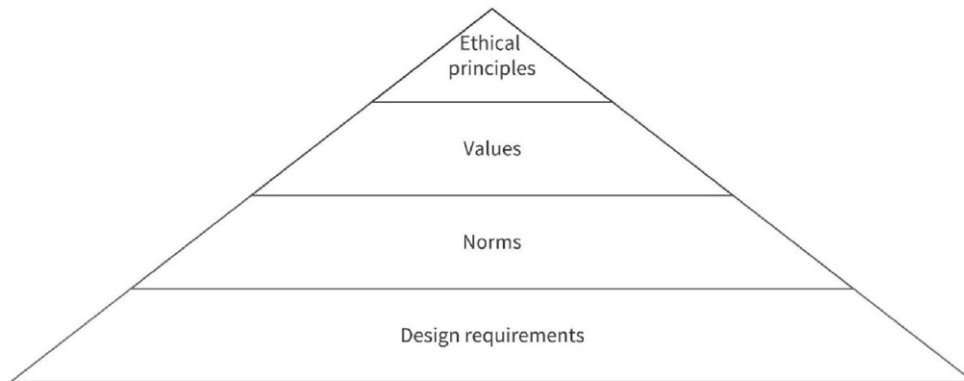
## Values hierarchy framework



**Fig. 1** The values hierarchy in this work consists of ethical principles, human values, norms, and design requirements (graphic by the authors, inspired by (van de Poel 2013))

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# DESIRA Ethical code

### Ethical foundations

*Bio-ethical principles*

*Human rights*

*Virtue ethics*

### Values & virtues

| Responsible | | Innovation |
|---|---|---|
| justice | | courage |
| anticipation | | self-control |
| perspective | practical | dedication |
| humility | wisdom | vocation |
| honesty | | curiosity |
| civility | | creativity |
| inclusion | | flexibility |
| compassion | | cooperation |

### Norms & requirements

*Norms, requirements & principles for*

*Design*

*Access*

*System Complexity*

# DESIRA Ethical code

### Ethical foundations

*Bio-ethical principles*

*Human rights*

*Virtue ethics*

| Responsible | | Innovation |
|---|---|---|
| justice | | courage |
| anticipation | | self-control |
| perspective | practical | dedication |
| humility | wisdom | vocation |
| honesty | | curiosity |
| civility | | creativity |
| inclusion | | flexibility |
| compassion | | cooperation |

### Values

### Norms & requirements

*Norms, requirements & principles for*

*Design*

*Access*

*System Complexity*

DESIRA

DIGITISATION: ECONOMIC AND SOCIAL IMPACTS IN RURAL AREAS

Thank you!

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DESIRA H2020

What ethical issues should we consider for building our Ethical Code?
Wordcloud Poll · 30 responses

Doesnt work .. only 20 ch
Fairnes
Who use data? For what?
Power relations
fitness to the context
technology development
Farmers rights
Privacy is key.
use of data · trust
bias · AI
Care · fairness · Data ownership · discrimination
deskilling
wrong prediction · ownership
labour safety
partnership · competitiveness
Providers of data involve · data generation · Market power
Consumer rights · Involvement · Comanagement

slido

# 6. Conclusion

The Training Kit report (D6.4) is a valuable resource, not only for all stakeholders involved in the DESIRA project, but also to practitioners and researchers working in the field of rural and agricultural digitalisation. The report compiles all the training materials delivered during the project's implementation, provides an editorial update of the methodology, disseminates guidelines for scenario development produced by DESIRA.

The report's methodology involves a comprehensive compilation of all the training materials used during the DESIRA events of WP2, WP3, and WP4, and a process of content analysis to identify key themes and patterns across the various documents, covering a wide range of topics, including assessing past and present impact, developing scenarios, use cases, and showcase technologies, and policy roadmap and ethical code.

The materials will facilitate ongoing capacity building, impact assessment, and scenario development, and ensure that the knowledge created through DESIRA reaches a wider audience beyond those in direct contact with the project.

The potential for replicability and adaptability of the training materials to similar subjects is also high. This report can serve as a model for future training activities in other projects, allowing for the effective transfer of knowledge to stakeholders both in rural areas and the academy and the acceleration of knowledge creation.

Overall, the Training Kit report is a valuable contribution to the field, demonstrating the potential of capacity building, impact assessment, and scenario development in rural areas, and highlighting the value added by DESIRA in the field of digitisation in rural areas.

# 7. REFERENCES

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