iGUESSmed
HIGH QUALITY TOMATOES
WITH LOW ENVIRONMENTAL IMPACT

INNOVATIVE GREENHOUSE SUPPORT SYSTEM IN THE MEDITERRANEAN REGION: EFFICIENT FERTIGATION AND PEST MANAGEMENT THROUGH IOT BASED CLIMATE CONTROL — IGUESSMED

Deliverable 4.1
Conceptual and Analytical Framework

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Dissemination Level

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1. Introduction

The iGUESS-MED project aims to develop a Decision Support System (DSS) to manage fertigation and prevent plant diseases effectively and pests in tomato crops grown in soil and soilless in commercial greenhouses of the Mediterranean region. This innovative greenhouse DSS will be developed to (i) help greenhouse farmers to improve the management of fertigation in areas with low (saline) quality waters (ii) to reduce the use of chemicals by a sustainable and integrated pest and disease control, and (iii) to improve the climatic efficiency in the existent greenhouse by low-cost climate actions. The DSS will allow obtaining healthier and higher quality productions and higher yields, while will reduce the use of water and the losses of nutrients and chemicals to the environment. iGUESS-MED will manage efficient fertigation, forecast diseases and pests, and improve the climatic efficiency in tomato greenhouses, using only climate data acquisition and basic information on cropping system. The DSS will provide feedbacks and alerts about crop needs and real-time recommendations to the farmers through friendly portable real-time data visualisation tools as PC, tablets or smartphones. We perform new models for calculating crop evapotranspiration will be performed by integrating sensor data from plant, soil and climate, and forecasting models for assessing disease and pest risks will be developed by using the Integrated Pest Management.

The project consortium (research centres, SMEs and end-users of EU and non-EU countries belonging to the Mediterranean basin) will collaborate from the beginning to make the DSS marketable involving, end-users and stakeholders to validate the system in own greenhouses, reducing gaps between research, application developers and farmers. The application of DSS will benefit the workers and the consumers, providing better working conditions, crop healthiness and reduction of environmental impact.

1.1. Objetives and definition

The DoW indicates two main objectives for the socio-economic analysis pursued through the development of Living Labs (LL).

- Objective 4

To create a mutual learning space and facilitate technology exchange between EU and non-EU MED countries, boosting capacity building locally, empowering a new generation of innovative and younger entrepreneurs, allowing for gender inclusiveness in working environments and promoting a circular and sustainable greenhouse farming in the MED Basin.

- Objective 5

To assess the environmental and socio-economic impacts of innovative tomato cropping systems in commercial greenhouses, under a life cycle thinking perspective, thereby highlighting intervention's cost-effectiveness and gender-related issues.

The LL approach is the core of the WP4. It will be created in each site to involve local stakeholders in the creation, validation and testing of the new technology and the associated new greenhouse management system in real production facilities and contexts.

The Living Lab will discuss the knowledge gaps, end-user needs, working conditions, gender issues, and the usefulness and social acceptability of the innovation.The Living Lab approach will develop the socio-economic assessment by triangulating qualitative and quantitative information using primary and secondary data. The Living Lab will support an enabling environment to allow technology and management system adaptation to site-specific needs and issues.

The LL represent a community of actors, which are organised around the following focal question:

"How to improve the competitiveness, environmental performance and efficiency of the MED protected horticulture sector by ensuring its social sustainability, especially by improving health-related issues, as well as gender inclusiveness and equality?"

LL will be open to a broad range of stakeholders, including SMEs, technology developers and suppliers, practitioners, NGOs, education and extension organisations, civil society, policy-makers and local administrations, and local communities, among others

1.2. WP4 structure

The overarching objective of WP4 is to create an enabling environment for the transition towards sustainable, resilient and inclusive greenhouse cropping systems.

Sub-objectives are as follows:

- To boost stakeholders' involvement, to empower a new generation of farmer and to overcome gender barriers
- To provide sound evidence-based information about the socio-economic and environmental performance of the innovative solutions proposed in previous WPs, emphasising country-specific issues.
- To support farmer investment decisions while promoting social dialogue, gender equality and inclusion, by removing knowledge barriers

- **Task 4.1**

T4.1 (M0-M18): CAJAMAR, UNIPI, Akdeniz University, and CRRHAB.

Aims: The task aims to develop the conceptual and analytical framework for the socio-economic impact assessment based on a systematic literature review.

Approach:

- The outputs of the conceptual and analytical framework will involve the concepts and methods to be applied in tasks 4.2 and 4.3, as well as data needs. The task will identify the critical country specific sustainability and gender issues, focusing on case-specific issues, including policy, governance, state-of the-art technology and gender issues, which will be used to formulate living labs' focal questions.

- The task will interact with WP2 by highlighting relevant sustainability issues to be investigated.

- **Task 4.2**

T4.2 (M12-36): UNIPI, CAJAMAR, CREA, Akdeniz University, and CRRHAB.

Aims: The living labs aim at assessing feasibility and sustainability of technology adoption includes will combine Life Cycle Sustainability Assessment, cost-effectiveness analysis and participatory activities. This task will inform about the potential environmental, economic and social impacts and the trade-offs among them.

Approach: The theoretical and analytical framework (T4.1) will be shared with stakeholders during living labs to allow knowledge co-creation and continuous technology improvement. This will allow to meet investigate site and country-specific needs. During the living labs, hands-on sessions will help improve and target the DSS to specific needs.

This task includes two subtasks

- T4.2.1 Life cycle sustainability assessment (LCSA) (M12-M24).

It will adopt a life cycle thinking perspective to develop an environmental Life Cycle Assessment, a Life Cycle Costing and a Social Life Cycle Assessment, based on data gathered from living labs and the guidelines provided by task 4.1. Multiple assessments will be carried out to compare the stages of DSS adoption; intermediate LCSA outputs will be discussed during the living labs to allow for applying value judgement to LCSA result, thereby ending with a single score assessment, which will facilitate result use for evidence-based decision making in policy and business.

- T4.2.2 Assessment of stakeholders needs, expectations and impact (M12-M36).

It will combine a participator appraisal of the Needs, Expectation and Impacts (NEI) with a simulation of impacts of the proposed solutions. For starters, a data collection will be performed. Then, a participatory workshop (10 relevant stakeholders) will be carried out in each country at the Living lab level, based on the guidelines provided by task 4.1 and after 5 preliminary interviews with key informants. Those activities will aim at assessing the past and current needs, as well as the expectations and impacts of the proposed solution in each living lab. The candidate analytical method for to assessing potential impacts of the introduction of the new technology is the Bayesian Belief Network.

The task 4.2 will be implemented in Turkey, Tunisia, Spain and Italy.

- **Task 4.3**

T4.3 (M24-M42): **CRRHAB**, Akdeniz University, UNIPI, UAL; BIOPLANET, and La Caña.

Aims: The main goal of this task is to establish a Community of Practice (CoP) by stimulating a continuous interaction among stakeholders and coordinating education and training of growers as well of young and prospected farmers, through specific capacity-building activities.

Approach: A list of 20 potential stakeholders will be drafted, which can benefit from establishing a continuous information exchange through one Workshop and one training events. The former will validate and disseminate project results. The latter will address growers and new entrants in agriculture as well as PhD students, Post Doc and young researchers to co-create transition pathways towards circular and gender-inclusive greenhouse farming. In addition, an open section will be created in the iGUESS-MED website to promote stakeholders' interaction and facilitate social acceptability of the proposed solution. Table 1 presents the main WP4 outcomes.

Table 1 Description and dead-line of the deliverables and milestones expected from WP4 of iGUESS-MED project.

List of WP4 outcome	**Description**	**Due to**
D4.1: Conceptual and analytical framework	It will contain both conceptual and analytical framework to conduct the impact assessment	Month 12
D4.2: Protocol for living labs creation	It would contain the protocol for data collection and LCA	Month 14
D4.3: Feasibility and sustainability assessment document	It will be developed by integrating the intermediate LCSA outputs and by combining country-specific and socio-economic impact assessment results	Month 36
D4.4: Mutual learning and knowledge co-creation	It will include results of outreach activities	Month 42
MS4.1 Guidelines for harmonised data collection for environmental and socio-economic impact assessment	Approval of Guidelines and workplan by all partners in charge of LL.	Month 6
MS4.2 Environmental and socio-economic impact assessment	Accomplishment of the socio-economic impact assessment	Month 42

2. Problem statement

2.1. Impact of greenhouses production

Sustainable food production and consumption is currently a major concern for consumers and governments. Population growth has led to increased demand for food, leading to an increase in intensive agricultural practices. Greenhouses have successfully provided abundant, affordable, high-quality products using resources with very high economic efficiency (Golzar *et al.,* 2019). The Mediterranean basin's protected crops have thus had a rapid expansion reaching in little more than 50 years an area of about 200.000 hectares, destined to greenhouses and greenhouse tunnels (**Errore. L'origine riferimento non è stata trovata.**) (Torrellas et al., 2012). The table also indicates the incidence of soilless cultures

Table 2 Diffusion of protected cultivations (divided into greenhouses and high tunnels and low-tunnels) in the Mediterranean area and share of soilless production.

Country	Greenhouses and high tunnels	Percentage of greenhouses with soilless culture	Low tunnels	Total protected cultivations
Algeria[1]	6.000	1.0%	200	6.200
Tunisia[1]	1.307	1.3%	11.000	12.307
Egypt[1]	2.430	n.a.	23.000	25.430
Morocco[1]	10.000	n.a.	n.a..	10.000
Israel[1]	6.500	23%	15.000	21.500
Turkey[1]	14.000	n.a.	1.500	15.500
Cyprus [1,2,3]	235	17%	n.a..	235
Spain[2]	60.000	5%	13.055	73.055
Italy[2]	33.230	9%	25.000	58.230
France[2]	9.370	30%	15.000	24.370
Greece[2,3]	6.000	5%	4.500	10.500
Total	**149.072**		**108.255**	**257.327**

Legend: [1] Jouet, 2004; [2] Incrocci et al, 2020; [3] Massa et al., 2020; n.a., not available.

Different climatic and market conditions have had a strong influence on protected horticulture's technological and economic development. For example, the Mediterranean greenhouse cultivation is characterised by poor structures (reduced light transmittance, poor ventilation, strong daily temperature range), low technological level, extensive Use of the workforce, poor availability of water (often excessively saline) and reduced turnover.

Because agriculture is such a competitive business, farmers seek efficient use of resources to achieve maximum economic benefits. In the last ten years, environmentally sustainable production has also emerged, as industrial greenhouse crops are usually highly polluting. Intensive horticultural production systems based on medium and low technology greenhouses, such as Mediterranean greenhouses, are suitable scenarios for implementing bioeconomy strategies to

achieve global sustainability objectives in the food supply chain. Since the publication of the European Bioeconomy Strategy in 2012 (updated in 2018), policy measures to promote the bioeconomy are responsible for changing what is now considered obsolete production systems towards more high-tech models, able to respond to climate change challenges (Egea F.J. *et al.*, 2020).
Therefore the literature has shed light on the following elements of sustainability:

- guaranteeing food security and safety;
- manage natural resources in a sustainable way (water, soil, plant biomass);
- reduce dependence on non-renewable resources and fossil fuels, to contribute to circular economy;
- mitigate the effects of climate change by adapting energy structures and inputs to site-specific needs;
- improve waste management by reducing waste or incorporating it into recycling and reuse systems;
- reduce the loss of biodiversity caused by pollution from pesticides and fertilisers;
- create jobs and maintain European competitiveness;
- raise public awareness of the importance of investing in the green infrastructure needed for created resilient production systems

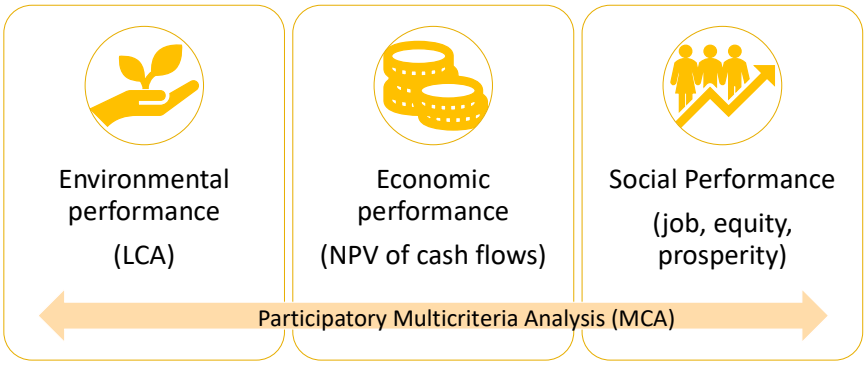
2.2. Socio-economic assessment

The WP's objective is to provide multifactorial and transdisciplinary research that allows a transition towards an agricultural model that supports simultaneously the prosperity of rural areas, equity among all actors involved, and ensuring an ecological transition of the greenhouses system. Reliable and comprehensive decision support needs to be inclusive, encompassing the following point of view:

- environmental impact; through Life Cycle Assessment (LCA), which serves to identify the main environmental contributors of the different production systems to develop and design efficient input alternative
- economic; through an assessment of stakeholders needs and expectations site-specific sustainable solutions
- social; providing new jobs, and improving current working conditions, characterised in many countries by exploiting immigrant labour and a gender-based labour regime (Palumbo *et al.*; 2018).

The complexity of the sustainable dimensions and the different stakes involved among all actors requires a participatory approach to co-develop a suitable solution for Greenhouses. The WP4 will apply a participatory multicriteria assessment to estimate the socio-economic impacts. Figure 1 presents the conceptual approach that will be applied in the Living Labs.

Figure 1. The conceptual approach of participatory assessment



Although the sustainability of Greenhouses has been investigated under different perspectives, the impact of new technologies and needs to be inclusive, and the solution must be designed to account for the preferences of the relevant stakeholders. Therefore, the project represents a unique opportunity to the Greenhouses as a socio-technological system (see section 1.5) and how such a system can affect local and global stakehodelrs. Table 3 presents the main stakeholders involved and their impact category.

Table 3. Preliminary list of stakeholders and dimension affected by Greenhouses.

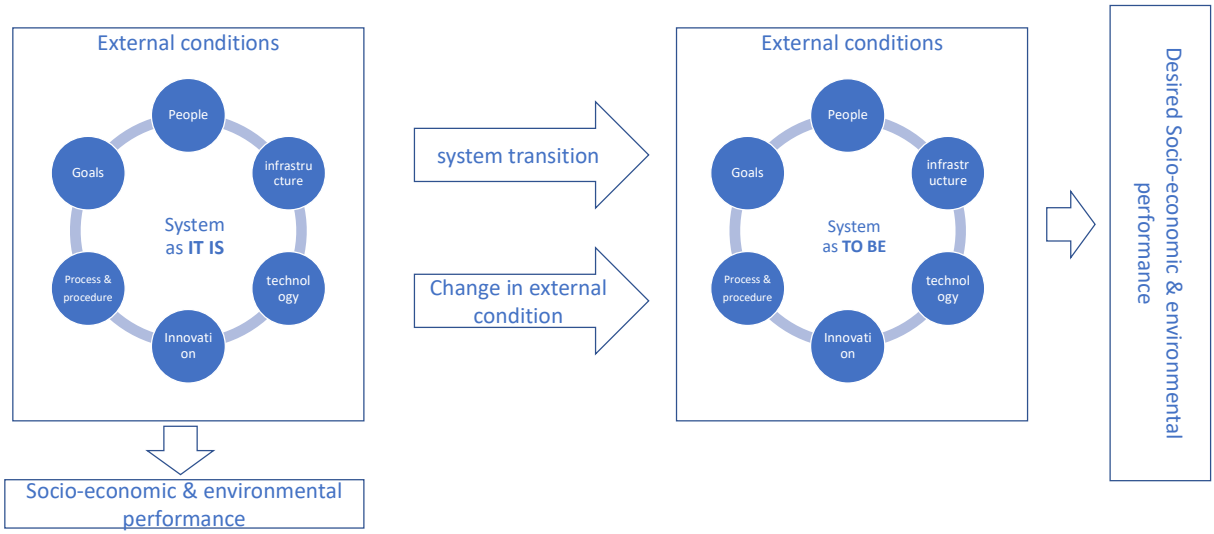
Stakeholders	Impact category
Workers	Human rights, equity
Local community	Prosperity, job and income opportunities; working condition, pollutions
Consumers	Food security, safety, cultural heritage, quality of production
Value chain actors	Shared value; governance; equity
Society	C02 emissions, food security and safety

2.3. Socio-technical system of greenhouses production in each country

A growing literature describes the interplays between innovations, human and ecosystem in the socio-technical system (STS). The STS concept describes the system's evolution due to interacting internal sub-systems (i.e. people, infrastructure, technology, culture, procedures, goals) with external conditions (formal and informal institutions; policy and political, environmental, demographic, social conditions).
This approach can ensure large engagement and understanding of both how the current system is working ("system as it") and how the project can be improved ("system to be").

This concept implies describing the inherent trajectory of change of any STS and external condition, which may affect the reaching of a desirable transition toward sustainability as defined by the LL focal question. Figure 2 summarises the concepts

Figure 2. Baseline conceptual framework



The approach requires actors' engagement to co-create a desirable transition by focusing on current socio-economic and environmental performance. In accord with the baseline conceptual framework, the WP4 analysis will focus on:

1) Description of the system as it is (tasks 4.1 & partial 4.2)
2) Impact appraisal (task 4.2)
    a. LCA
    b. NEI
3) Co-creation process towards the **system as to be** (task 4.3)

Point 2 and 3 are not included in the current guidelines as LCA and NEI guidelines are supposed to be delivered at month 14 and month 24, respectively.

2.4. Workplan

Table 4 summarises the working plan for WP4. The work plan includes all activities of task 4.1 and 4.2. The deliverable D4. 2 (protocol for Living Lab) will provide further details about participatory workshops and the LCA assessment.

Table 4. Working plan for WP4.

Task	Reference to the conceptual framework	References to activities	Contents	Timing	Outcome	Proposed activity in each LL
4.1	Description **of the system as it is**	Preparatory activities	Description of the main characteristics of Greenhouses production in the country	Month 14-18	Description of diffusion, typologies, products, markets of greenhouse productions in each country	Secondary documents and literature review
			Definition of Focal question & understating of the main set of stakeholders involved	Month 14-18	a) identification of focal question b) Preliminary Description of context and STS	Secondary documents and literature review
			Formulation of critical country-specific sustainability and gender issues	Month 14-18	Finalise focal question and selection of the most relevant socio-economic and environmental indicators	Interview to key informant
4.2		LL	Description of the context	Month 14-18	Description of external factors which affects the STS	Secondary data + 5 interviews with key informants
		LL	Description of greenhouses STS	Month 14-18	Description of STS system of LL and innovation	Secondary data + 5 interviews with key informants
	Impact appraisal	NEI (methodology will be developed in D4.2)	Stakeholders' and society's *NEEDS and EXPECTATION*	Month 30-36	Narrative & SWOT analysis	Interview to key informant
		LCA (methodology will be developed in D4.2)	Socio-economic and Environmental Impacts	Month 18-30	The measure of impact on relevant socio-economic and environmental parameter	Collecting data as expected in the protocol for LL (D4.2)
		Analyse Impacts in each LL	Stakeholders' and society's *IMPACT*	Month 30-36	Estimation of trade-off among different impact domains and drivers of impact (i.e. STS structure, internal and external conditions)	Workshop (* option to BBN)

4.3	Co-creation process - System **as to be**	Community of practices	Social acceptability of the proposed solution	Month M24 -42	Questionnaire about acceptability (Political, Economic, Sociological, Technological, Legal and Environmental -PESTLE methodology)	Questionnaire to 20 stakeholders & one final Workshop

2.5. Guideline for Description of the system as "it is"

In each LL will be developing the following activities:

- Preparatory activities
- Description of the context
    - Representation of the current Socio-technical system
    - Assessment of needs and expectations

2.5.1. Preparatory activities

The preparatory activities will allow the LL members to check the proposed LL's feasibility and collect information needed for the next tasks. The preparatory activities would be based on filling a common template collecting information to explore the feasibility of LL and understand the qualifying case-specific elements of context and system.

Moreover, these activities will help build an initial relationship with the main actors that will constitute the living lab. Considering COVID-19 restrictions, we propose to collect secondary material (deliverables from previous projects, published paper) and up to 5 interviews with the key information.

These activities concern:

1) Description of the diffusion of Greenhouses in each country;
2) Refinement of focal questions around which the LL will be established;
3) Description of the current STS for greenhouses production;
4) Setting up the LL;
5) Identification of country-specific sustainable issues.

2.5.2. Description of diffusion of greenhouses in each country

The section aims at describing the profile of greenhouse production in each country. This section investigates the dominant technological solution in greenhouses and a Description of the main production system (diffusion, typologies crops). The section also contains an overview of the current Mediterranean greenhouse farming system's economic, environmental and social performance. The information will be collected using secondary data (i.e. already published paper), official statistics, and interviews with experts and key informants. Annex 3 contains an example of questions that can be used for the interviews. Unipi is preparing an online version of the questionnaire to collect information instead of direct interviews.

Table 5. Description of greenhouse farming system (detailed of interviews in Annex 3).

Domain	Indicator	answer
Diffusion	Total area in hectares (ha)	
	Average extension	
	Distribution (concentrated or dispersed)	
	% entrepreneurs and foreign investments	
	Level technology	
	Structure: • type of prevailing structure (high tunnel, classic greenhouse, multi-span etc.) • Average eaves/ridge height • prevailing coverage type (plastic film, glass etc.) • type of opening • % heated greenhouses	
Performance	Main cultivated crops (up to five)	
	% tomato production	
	Average annual production (t)	
	Average annual profitability (€)	
	Annual waste production (plastic, substrates, etc.)	
Technology	% of soilless culture and main technique used (hydroponic, substrate, aeroponics etc.)	
	The main substrate used	
	Irrigation: • main irrigation system in soil and in soilless crops • Irrigation scheduling in soil crops and in soilless crops • % closed or semi-closed cycle systems	
	Dominant pest control typology (organic, integrated etc.)	
	Climate control technique (manual, automatic, temperature sensors etc.)	
	Excess humidity control technique (fans, greenhouse opening etc.)	
	Low humidity control technique (mini-fog, foliar spraying, etc.)	
	Chemical inputs (Type and number of treatments)	
	Crop protection (chemical, biological, etc.)	
	% sustainable systems (e.g. rainwater storage, Use of renewable energy, etc.)	
Worker	Level of specialisation (roles and mansions)	
	Level of salary	
	Average working hours	
	Type of contract (fixed-term or open-ended)	
	Immigrant/national workers ratio	
	Top five country of origin of workers	
	Average age immigrant workers	
	Male/female ratio	
Economics	Estimated production costs	
	Higher production cost (labour, transportation, irrigation, etc.)	

	Incentives and facilities for technological and eco-sustainable investments	
Production chain	Main stakeholders (seed producer, fertiliser and defence systems, technical consultancy, transport, waste disposal, et.)	
	Distribution market (GDO, local market, direct sale, etc.)	
	Critical point	
	Public opinion on greenhouse products and environmental impact	
	Manufacturers opinion on manufacturers' confidence in IoT	

2.5.3. Definition of focal questions and preliminary Needs and Expectations

During the first discussion with the contact person, each LL should provide and reside the focal question. The DoW define the initial focal question as: **"How to improve the competitiveness, environmental performance and efficiency of the MED protected horticulture sector, by ensuring its social sustainability, especially by improving health-related issues, as well as gender inclusiveness and equality?"**
A country-specific focal question should be identified in each LL, possible splitting in sub-questions if relevant. Table 6 contains a suggestion to summarise both past needs and future expectation of the greenhouses production in each case study area.

Table 6. Needs and expectations.

Focal question and sub-focal question	Past Needs (5- 10 years)	The expectation for the next 10 years

2.5.4. Preliminary Identification of STS

Any LL has to describe the greenhouses as a Socio-Technical System (STS) following the definition provided in the previous section. The objective of this part of the preparatory activity is to provide a baseline description of the STS against four main points:

1) What are the main actors that interact with the greenhouses production in each case study?
2) What are the main resources/entities mobilised in greenhouses production in each case study?
3) What are the main drivers involved in greenhouses production in each case study and how they interact in driving changes to greenhouses production in each case study?

4) What are the main impact domains of greenhouses production in each case study?

The LL will progressively build socio-technical system representations through an interactive process using both the preliminary activities and interview to key informants and validating it during the participatory Workshop.

2.5.5. Actors

During the first interview with the key informants, it is possible to define a set of actors contributing or affected by the production of the greenhouse in the LL. It is also important to outline a scheme of inquiring about considering a more comprehensive stakeholder categorisation relevant for the greenhouses production. It is possible to determine six actors groups:

- Agriculture, agro-industries;
- Policy & administration;
- Technology & ICT;
- Civil society;
- Research & innovation;
- Services & consumption.

During the first interaction with the LL contact person, the interviewers should consider the most relevant actors groups (Table 7). Actors to be included should cover both direct and indirect. The formers are those who use or whose practices have a direct impact on key resources of the territory, while the latter are people whose actions will encourage the direct stakeholders to change their practices.

Table 7. Actor Groups.

Group	List	Direct	Indirect
Agriculture, agro-industries	i.e., farmers, processing industries, manufacturing firms, Unions, etc.		
Policy & administration	i.e., regional and local Policy-makers, mayors for municipalities, etc.		
Technology & ICT	i.e., start-ups, software/hardware companies, etc.		
Civil society	environmental/cultural associations, citizens' representatives, schools, etc.		
Research & innovation	i.e., universities, research institutions, etc.		
Services & consumption	i.e., service companies, credit institutions, wholesalers, costumer associations, etc.		

2.5.6. Entities

Resources refer to any goods, products or other means used by any of the stakeholders previously identified. They can be grouped into three main categories:

1) Socio and economics: good and products used also considering markets, institutional job elements and formal rules and regulations and informal – cultural non-written rules, norms and values
2) Environmental: living organisms (plants, animals, etc.), physical things to support living and working in the (natural) environment (e.g. analogue technology, infrastructure, finances);
3) Technical: the innovation and technology mobilised and applied in the greenhouse concerning production system (soiless) or technology adopted (big data; sensors; front-facing technologies and applications).

Table 8 provides a synthesis of the main information to be collected.

Table 8. Description of resources.

Domain	Entities	Description
Socio-economic		
environmental		
Technical		

2.5.7. Drivers

The drivers are both main internal and external factors that are supposed to affect the structure and function of STS. Table 9 provides an initial list.

Table 9 Examples of drivers considered when describing the context since the last ten years

Factors	Description
Group age distribution (i.e. *are elderly 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.*)	
Environment (*Use of renewables, organic prodcution, etc.*)	
Digitalisation (*people using the net for interact with public authorities, etc.*)	
Social concerns in the area (*food security, social justice etc.*)	
Level of tecnhology	

Please, insert other parameters if it is necessary	
How has the system changed in the last 10 years	

2.5.8. Impact domains

The aim is to describe the main dimension affected by greenhouses production in each case study by considering both past and current impact on sustainability.
Table 10 considers the main dimensions affected by the greenhouses production

Table 10. Main aspects related to the impact of GH productions.

Impact area	Description	Past	Current
Economic	(i.e. income of GH producers)		
Environmental	(i.e. C02 emissions)		
Social	(i.e Worker conditions; gender)		

2.5.9. Summary

After describing the STS as it is, Table 10 aims to collect information on the main critical points on the greenhouse's STS. The critical point represents the main area of concerns that will be investigated in task 4.2

Table 11. Socio-Technical System critical points.

Critical points	Description

3. Proposed Timeline

- From May to August 2021 (M14-M18)
    - preliminary activities using secondary documents and one/two interviews with experts:
        - Description of GH production (Table 5)
        - Focal questions (Table 6)
        - Preliminary list of Actors (Table 7)
        - Preliminary list of elements and Interactions (Table 8 and Table 9)
    - Interview to stakeholders
        - Impact domain (Table 10)
        - Critical point (Table 11)
- Next step Living Lab (protocol data collection D4.2)
    - 1) LCA
    - 2) NEI assessment

4. Stakeholders involvement in WP4

Following the Ethics Guide, all stakeholders and actors involved in the project have to fill the consents form.

Therefore, the following procedure should be ensured.

- Translate it in your language, information sheet and privacy statement, and informed consent forms (if your stakeholders do not speak English). Both documents are available in annexes 1 and 2.
- Fill in the missing information highlighted in yellow
- Ask the signature
- Convert the document into a PDF
- Save the pdf in your repository

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Annex 1 Information Sheet

i.GUESS-MED is a PRIMA (Partnership for Research and Innovation in the Mediterranean Area) project, relates to the Call: Section 1 – Farming Systems 2019 and belongs to the IA – Topic 1.2.2: "Sustainability and competitiveness of Mediterranean greenhouse and intensive horticulture"

I guessed supports the transition toward innovative, sustainable and competitive Mediterranean horticultural greenhouses by developing, validating and transferring a pioneering Decision Support System (DSS) for the MED greenhouses, which is able to:

- REDUCE NUTRIENT LEAKAGE into sub-surface and groundwaters by optimising the fertigation management (both irrigation and fertilisation) under low quality water conditions;
- REDUCE THE USAGE OF CHEMICALS thanks to a sustainable and integrated pests and diseases control;
- INCREASE THE PRODUCTIVITY thanks to an improved and cost-effective efficiency of climatic control procedures, introducing specific low-cost solutions to apply to pre-existent greenhouse structures

The project will be carried out on tomato as reference crop, in soil and soilless culture in low-tech greenhouses typical of the Mediterranean region, by applying participatory and integrated interdisciplinary toolkit of novel and emerging technologies such as sensor technology, IoT, advanced agronomic management, simulation models and self-calibrating mathematical algorithms.

The project started in APRIL 2020 and has an extension of 4 years.

The iGUESSmed consortium is comprised by 4 of the most important countries in Med-area as regards the greenhouse tomato cultivation, 2 European (Italy and Spain) and 2 non-EU (Turkey and Tunisia). There are 7 entities from the 2 European countries and 2 entities from 2 non-EU countries, from which 1 very small company, 1 SME, 1 big company, 1 non-profit foundation, and 5 RTDs.

Annex 2 – Privacy notice and Informed Consent Forms

Privacy notice

The [Name of the Organisation] will use your personal data for the purposes of the research undertaken in the iGuessmed project. Our legal basis for processing your data is that it is necessary for the performance of a task carried out in the public interest in relation to research funded by the PRIMA, supported under Horizon 2020.
We are the Data Controller over your personal data. We will not share your personal data beyond the project team, unless required by law and shall only retain it according to good scientific practice for as long as is necessary to fulfil the research undertaken on the project, to deliver project outcomes, and to fulfil the requirements of the funder. For further information, please contact our Data Protection Officer on [add email address of data protection officer][1].

[Insert data collector name]
Contact details:
[Name of organisation]
[Address]
Email:
Telephone:

Informed Consent

Name and organisation of data collector:_____

Name of the research participant: _____

1) Consent statement
the research participant have been informed that:

- Data is being collected as part of the PRIMA Project IGuessMED.
- Data collected, audio recording, video-shooting and photos may be taken and used for research, dissemination and communication purposes.
- Data will be analysed by members of the IGuessMED project, and in some cases may be analysed by project members other than the interviewer.
- Participation is voluntary.
- Consent can be withdrawn at any time without reason.
- Participants can access personal data at any time without reason.
- Data will be anonymised if possible. In cases in which the data cannot be anonymised, any publications will be shown to identifiable participants for further consent for publication.
- Data will be safely stored in certified repositories for long term preservation and curation.

[1] If there is no privacy notice on the partner's website, and if a partner does not have a Data Protection Officer, substitute the sentence with the following: "For further information please contact [add email address of person responsible for data protection]."

Signed _____ (participant)
Date _____

2) Recording of consent
Project partners will keep evidence of consent by recording.

Name of the person who gained consent: _____

Data and time that consent was given: _____