

## Key emerging findings from the PEGASUS project

June 2017

Anne Maréchal and David Baldock, IEEP

This paper should be cited as follows: Maréchal A., Baldock D., 2017. *Key emerging findings from the PEGASUS project*. Report published as part of the Horizon 2020 PEGASUS research project. Available at: <http://pegasus.ieep.eu/>.

### Introduction

PEGASUS (“Public Ecosystem Goods and Services: Unlocking the Synergies”) is a Horizon 2020 research project involving 14 partners in 10 EU countries and coordinated by IEEP. The objective of the project is to assess and stimulate more effective provision of public goods and ecosystem services from EU farmland and forests, by re-thinking rural land management and identifying the systemic and dynamic interactions and impacts between various drivers, including policy. As well as being a vital resource for production of food, fibre, timber and energy, rural land is also a major source of environmental and socio-cultural goods and services, including climate regulation, biodiversity, water quality, soil functionality, flood management, cultural landscapes, rural vitality and recreation, many of which have public goods characteristics, to varying degrees. Yet these potential environmental and social benefits continue to be undervalued in land management decisions in the EU agriculture and forestry sectors.

The PEGASUS project is designed to explore key questions about how best to improve the social and ecological resilience of farming and forestry systems in the EU through enhancing the sustained provision of environmental and social benefits. The project has identified a series of 19 environmental and social benefits which the research suggests society values as desirable outcomes from agriculture and forestry, alongside economic considerations which often prevail in decision making processes (see Annex 2 for the full list). The project research is multi-disciplinary and rooted in 34 case studies in ten European countries (see Annex 1). The case studies span a variety of conditions and challenges relevant for the EU as a whole and its related policies, from Estonia to Portugal. This knowledge is being used to develop practical tools – maps and guidance – and recommendations for both policy and practice on how to encourage action through different forms and combinations of governance, institutional settings, regulations, policies at different levels, private sector engagement and market measures.

This paper presents the key *emerging* findings from the PEGASUS project so far (in particular our 34 case studies) which we believe are relevant to the current as well as next generation of European agricultural, forestry and rural policies. We welcome discussion and feedback on these findings to inform our ongoing analytical work and the development of practical tools and policy recommendations over the next six months. The full case study reports and all deliverables of the project are available at: <http://pegasus.ieep.eu/>.



The variety of approaches taken to incentivising the provision of public goods and ecosystem services in rural areas provides a rich source of experience to inform thinking about how such initiatives can develop in future, including within the CAP. These approaches have been the focus of the PEGASUS action research activities in the case study areas, engaging in depth with the views and experiences of different stakeholders.

A selection of the emerging findings from PEGASUS is set out below.

**Emerging finding 1: *The provision of economic, social and environmental benefits often can be delivered more effectively when the approach and mechanisms involved arise as a collective effort from well-grounded and operational relationships between key actors operating in a region or along a supply chain.***

The initiatives that have been the focus of the PEGASUS case studies often deliver multiple benefits. As a result, trying to disentangle the connections between social, environmental and economic outcomes (and the drivers influencing them) to deal with them separately is a difficult exercise. Rather, PEGASUS results suggest that, often, a fuller and more balanced package of economic, social and environmental benefits can be delivered when the mechanisms enabling their provision are designed coherently and rooted more deeply in a territory, landscape or along a supply chain. It is important for governance and institutions to work jointly (not in competition) towards achieving an agreed basket of outcomes. Where policy measures are seen as free standing technocratic interventions, they are potentially less meaningful, robust or effective in influencing the provision of environmental and social benefits, both singularly and in combination.

The results in PEGASUS suggest that taking a territorial (i.e. an area that is relatively homogeneous based on a number of criteria<sup>1</sup>) or landscape perspective or a supply chain perspective can enable:

- desired outcomes to be more clearly identified, which allows synergies and trade-offs to be discussed and agreed between local actors in relation to:
  - different environmental outcomes
  - environmental, social and economic outcomes

For example, in Northern Italy, tomato producers created producer groups in the 1990s to enable better joined-up action to tackle soil and water quality and availability issues in the region, to ensure economic outcomes could be sustained in the long-term as well as compliance with the requirements of the Water Framework directive.

- A clearer identification of how policies can be used together in a synergistic way to facilitate the delivery of environmental and social outcomes

For example, in the Netherlands, the Skylark initiative which involves arable farmers and other actors in the supply chain, uses a mix of policies measures (e.g. the agri-environment-climate measure; the option of setting up an equivalence scheme for the greening payment under the CAP) to achieve more sustainable arable farming in relation to biodiversity, soil and water.

---

<sup>1</sup> e.g. prevailing agricultural/forestry systems, water catchment, habitat of species, similar soils, administrative territory or an area within the remit of the same institution/s, etc.

- More tailored approaches to be identified to help address local priorities and needs more effectively

For example, in Portugal, a few farmers and the University of Évora are now working together to find locally adapted solutions to preserve and develop the threatened traditional *montado* silvo-pastoral landscape which past policies have not been successful in.

Generally, achieving improved social and ecological resilience alongside economic outcomes from farming and forest systems is assisted by involving a stronger role for communities, local stakeholders and the private sector. The provision of a balanced set of outcomes from agriculture and forestry appear to be more sustained when it arises as a collective effort from well-grounded and operational relationships between key actors operating in a region or along a supply chain. Recognition and understanding of the dynamic interplay between policies, markets, and other exogenous drivers, etc., the synergies or conflicts that exist between them in particular situations or territories (whilst also noting inter-regional dynamics) are essential to inform policy development and implementation.

A number of the case studies illustrate this by showing that coming together to discuss how to find ways to deliver a more balanced set of outcomes can provide interesting insights into how to achieve greater social and ecological resilience within the agricultural and forestry systems considered. Participating in the problem definition, the design or the governance of mechanisms to be used is likely to inspire willingness to take action to address the issues identified. This is shown for instance by the case studies in the Dutch Drenthe province where landscape management is decided with local actors including the local residents, or in Celje's urban forests in Slovenia where owners, managers and visitors all engage in the management of the forests. The "beer and water" initiative in the Netherlands is another example where public bodies, farmers and the local brewery work jointly towards a common interest which is to maintain high quality and regular availability of water in their area.

**Emerging finding 2: *There can be a range of triggers motivating collective initiatives to emerge but in most cases, social capital, trust, good communication and cooperation are critical 'success factors' for enabling collective action to emerge and for the success of initiatives on the ground.***

There is a wide range of drivers or triggers that stimulated the setting up of the various collective actions studied in PEGASUS, some of which explain what motivates the engagement of the private sector. They can be grouped as presented in the Box. In many cases, it is a combination of drivers that worked together to create the impetus for taking action.

**Box: Main triggers motivating the setting up of collective initiatives in PEGASUS**

- Economic opportunities and/or the need to address growing economic pressures. In many cases, this is related to farming or forestry systems being at risk (e.g. abandonment or intensification trends) which threatens a sector or the wider community. A common strategy is to access or create a more remunerative or premium market. Examples are the organic grass-fed beef label in Estonia; the outdoor grazing scheme for dairy herds in the Netherlands attracting a higher milk price. Another is to increase viability through decreasing costs through more efficient techniques (e.g. the adoption of integrated pest

management techniques in the Marche region in Italy). Often this will also contribute to brand reputation and image. This can be of a region, like the Garfagnana valley in Italy, or of a commercial entity, such as with the multi-stakeholder partnership benefiting the brand image of the Volvic water company in their source catchment in central France.

- Regulation is another powerful trigger and it can act as a driver in a number of different ways, i.e. by stimulating action to comply with legislation as has been the case for the tomato sector in Northern Italy in the 1990s, or by providing a geographical focus and the set of requirements which an initiative can use to develop. For instance, there are a series of case studies which benefit from being located in Natura 2000 areas (e.g. the mountain wood producers in sub-Alpine Slovenia), or from other designations like the Biosphere Reserve Lungau in Austria.
- Environmental challenges, albeit less frequently, sometimes are found to drive the setting up of multi-stakeholder actions, e.g. in response to extreme weather events like flooding issues like with the 'WILD' collective initiative in the UK, which works with farmers and communities to improve water management; or declines in biodiversity and habitats as is the case in two NGO-led initiatives in Czech Republic. In one case, RSPB's Hope Farm in the UK, the objective and the driver was to demonstrate that environmental sustainability can go hand in hand with viable farming/forestry production.
- Appreciation of certain benefits by society is also highlighted as an underlying factor in many of the case studies. Societal appreciation can drive the protection or enhancement of socio-cultural and/or environmental values in an area or in products. For instance, the initiative behind the Green Belt of Frankfurt in Germany is based on the public appreciation of green spaces or the development of quality/origin labelled products from the UNESCO heritage designated National Park of Cévennes in France is also based on the societal appreciation of specific natural and cultural values. In fact, appreciation can sometimes be reflected in market prices and was found to be an important aspect in initiatives based on economic opportunities described above.

One of the key prerequisites to the development of collective action is trust and the ability of local actors to communicate and cooperate. In PEGASUS, this was found to be a critical factor in the initiatives we worked with, such as in the mountain wood initiative in Slovenia or the North Pennines multi-stakeholder partnership in the UK. This is because actors experiencing a good level of 'social capital' more naturally feel empowered and willing to take action at the local level, forming learning communities and developing new ways of working in the process.

The formation and the fostering of learning communities is especially valuable but it requires that the right conditions are in place so that trust and cooperation can develop. Active processes of engagement within local communities have proved worthwhile in several cases. In many of the PEGASUS examples, having strong local leaders was found to be particularly key. It often was the entrepreneurial spirit of these people which provided the necessary momentum for the successful implementation of the initiative.

We found that there are significant differences in capacities to carry out collective action in different parts of the EU. In some instances, conditions were relatively challenging, as noted in some examples in Czech Republic. However, in cases where a high level of trust and empowerment of local actors existed or was developed, there was likely to be an increased ability to respond to the different triggers that may lead to the formation of a collective group or action.



Actions that are collective are, almost by definition, more likely to encourage the involvement of a range of stakeholders in contrast to actions taken by individuals or one specific group (e.g. farmers or foresters). In collective settings, the interaction between the various types of stakeholders seem more likely to come up with creative solutions and develop a sense of ownership in the initiative, resulting in a greater engagement in and commitment to the initiative. The WILD project in England (UK) is a good case in point as enhanced trust between the actors enabled a greater level of delegation of responsibility by the managing authorities, a greater ownership of the problem by local actors and ultimately the implementation of solutions that have the buy-in of all stakeholders.

By contrast, fewer PEGASUS case studies explored situations where the conditions for the emergence of collective action are more challenging but there are some examples, e.g. in Slovenia, in France or in Czech Republic. The intensive olive grove production case study in Portugal shows an interesting contrasting case where there is little engagement and cooperation with local stakeholders and where social and ecological resilience is poor.

**Emerging finding 3: *The engagement of private actors can sometimes be valuable to delivering a balanced set of outcomes. The interplay between public and private actors (individuals or commercial entities) is critical for the sustainability of many initiatives and there is scope for strengthening it further in a wide range of schemes.***

Collective actions can take different forms and can be: 1) mainly public entities driven; 2) mainly commercial actor driven; 3) mainly driven by voluntary, civil society actors (e.g. NGOs); 4) driven by a mix of public, voluntary and private stakeholders. In the PEGASUS case studies, nearly all involve a form of collective, multi-stakeholder action, and often private actors are also involved.

In publicly driven initiatives, the results show that in all case study countries, there is a complex policy mix operating in different settings. Sometimes these policies operate in a coherent, complementary and synergistic way with the objective of enhancing the provision and/or appreciation of environmental and social benefits, but in other cases the mixture can create conflicting signals. Often public policy schemes interact with commercial initiatives of different kinds. The way these interact and the success of the interactions depends strongly on local governance structures as well as the role of local actors and their capacity to mobilise different forms of collective action. Understanding what factors enable particular actions to be taken is therefore important.

‘Private’ actors as a term can be interpreted differently. One group of these are simply private beneficiaries such as foresters or farmers benefitting from a rural development measure. PEGASUS has tried to explore the engagement of newer, more proactive private actors (and more mobilised beneficiaries) in particular private commercial companies (described in 2) above) having a link with agriculture and forestry either because they are newly created or downstream actors in the supply chain or because they depend on land-based resources and therefore can be affected by their management, e.g. water companies.

In many cases, private-led initiatives or private schemes can work well alongside publicly funded schemes in a mutually reinforcing way. While private initiatives are often (not always) based on a market approach, the public funding dimension, especially through Rural Development Programmes, is often critical. This is illustrated by the haymilk case study in Austria for instance where the ‘business model’ is based both on the price premium for the milk and the public support to farmers through the CAP notably through agri-environment measures, support for areas of natural constraints, in addition to direct payments. The *Liivimaa Lihaveis* grass-fed beef case in Estonia is another case where the extensive management of the species-rich grassland, on which the price premium for high quality beef depends, is supported using CAP agri-environmental support.

In other cases, however, private initiatives or market drivers (sometimes with the support of public funding) may send incoherent or even conflicting signals or are used in a way that counteracts the provision of environmental and social goods and services alongside economic outcomes. This is the case in the traditional *montado* landscape in Portugal or in the agro-forestry case study in a sub-Alpine region in Slovenia, for instance, where misalignment of policies and market drivers with the local reality have contributed to deterioration in the levels of social and ecological resilience.

At times, there can therefore be some disbenefits from the engagement of the private sector but proactively strengthening the conditions in which private and public initiatives can emerge in a genuinely synergistic way can help to encourage their objectives to be mutually beneficial, i.e. serving both private interests (often this means of a commercial nature) and those of wider society, e.g. environmental or social outcomes.

Finally, the engagement of private actors (in a broad sense) may provide some additional impetus regarding the continuation of the initiative over time. Not only is this because the approach does not exclusively rely on public funding which may disappear when resources are constrained, but also because over time, as private actors increasingly take responsibility for delivering social and environmental outcomes, this starts to become the new norm. Providing some longer term vision to land managers is important to ensure that they have sufficient commitment to the provision of benefits and that it can be sustained. Private initiatives combined with the use of public policies can be, in certain conditions, an effective means to safeguard the long-term provision of wide spectrum of environmental and social benefits.

**Emerging finding 4: *Governance and institutional aspects are critical in securing the durability and success of collective initiatives, especially where market signals are weaker. Having the right institutional settings is important not only to enable the emergence of collective action but also to maintain and cultivate a culture of trust between local stakeholders, including government and commercial actors.***

Learning from cases where trust was found to be an issue, there is a wide range of factors which may influence the willingness to cooperate and communicate amongst farmers, foresters and other rural actors. These include the specific social relations, market signals,



cultural drivers as well as institutional and governance arrangements. In this context, good governance in relation to local conditions can play a leading role in restoring trust. Ways of achieving this could include enhanced participation and representation, rethinking the rules around land management, or for managing authorities, the culture of controls and penalties, tuning policies and objectives to different timescales through multiannual programming of policies as well as new ways of delivery. The latter might include using results based approaches, improved tailoring of policy measures to local circumstances, incentivising cooperative approaches through policy or realigning conflicting policies to improve coherence and clarity.

In the PEGASUS case studies, we found that having the right institutional framework and strong governance arrangements was particularly important in cases where market/economic factors do not provide a strong incentive to players to organise themselves. For instance, in the Goričko natural park in Slovenia or in the Czech case where wet meadows providing a habitat for birds and amphibians have been restored – two cases where the provision of benefits have been declining and systems are at threat, governance aspects are central to the initiatives while market factors do not contribute directly to the approach.

**Emerging finding 5: *Increasing the public's appreciation of, and transforming this into demand for, environmental and social goods and services from agriculture and forestry systems would help to increase their provision.***

Civil society can be a powerful driver to trigger change and motivate action. The demand for or appreciation of environmental and social benefits by the public can be an important factor in creating the impetus for collective action. It can help support the translation of societal demand into concrete and sustained action. In some cases, this demand can be translated into economic or monetary terms, for instance through added value to a product, as illustrated by the milk premium payment for grazing dairy cattle outdoors in the Netherlands (where there is public appreciation of traditional landscapes associated with this practice) or the agro-tourism benefits arising from initiatives to sustain the rural identity in Garfagnana in Tuscany (Italy).

Amongst the PEGASUS case studies, there are however cases where a system may be declining in ecological and perhaps economic terms although signs are not immediately visible to a non-expert public. This is true for instance in the *montado* silvo-pastoral systems in Portugal or traditional orchards in Germany. In those cases as well as more generally, collective action may be focused to raising awareness about the issue. Efforts to raise public awareness generally can be expected to increase the public's demand for an enhanced provision of specific environmental and social services by agriculture and forestry and trigger an action in response.

**Emerging finding 6: *It can be difficult to establish causal linkages between management actions on agricultural or forestry systems and the related environmental and social outcomes they deliver, particularly over a short timescale.***

Environmental and social benefits arising from rural land and its management are the primary concern of PEGASUS. The case studies show that different stakeholders had differing understandings of certain types of benefits especially those for which it is more difficult to provide a universal definition such as rural vitality or the elements of food security which can be considered having some public/societal characteristics.

**Box: Defining and understanding environmental and social benefits**

Some environmental and social benefits can in principle be relatively precisely defined e.g. in relation to water quality standards that are specified in legislation or commercial products, as illustrated in the mineral water catchment (Volvic) in France. Other benefits or outcomes however tend to be understood much more broadly e.g. biodiversity or landscape character or, especially, rural vitality. This colours our understanding of the state of the provision of those benefits in the case study areas; there are only a few outcomes where we have solid evidence of state and change in the form of time series data (showing changes in nutrient contamination of water or farmland bird populations for example) and many more where we do not. In some cases the non-specialist public understanding of a positive or beneficial outcomes may differ from that of the “experts” and legislators. Farm animal welfare is probably an example. For instance, questions arise over whether the premium payments examined in one case study in North-Holland for milk from cows grazed outdoors for 6 hours per day 120 days a year reflect a real welfare benefit for the cows concerned, or are perceived to do so by consumers, while it is considered a clear benefit for the quality of the cheese.

The successful provision of environmental and social benefits associated with agriculture and forestry depends on a range of factors, including the intensity of land management, current farming or forestry practices, climate, environmental and other biogeographical factors. Land management choices influence provision of these environmental and social outcomes in a variety of ways and over differing timescales. For some of those benefits, evidence in the form of spatially-explicit and/or time series data is available but it is lacking for many others. Where data are available, it should usually be possible to establish causal relationships between farm and forestry management and the provision of environmental and social outcomes. However, the relationship can be difficult to measure very exactly at reasonable cost and so the evidence of the relationship between management and outcome can be rather sporadic. This is an area where PEGASUS will contribute through the development of maps showing – where possible – these relationships.

In many of the case study areas (although not all), there appears to be a decline in the provision of environmental and/or social outcomes and a growing appreciation of these benefits that is not being met by a Business as Usual approach<sup>2</sup>. Hence there is a need for initiatives and interventions of different kinds. Whilst there is little doubt that the provision of beneficial outcomes is taking place in the case studies, it is difficult to be certain at what level this is taking place and, in some cases, whether the particular outcomes mentioned as

---

<sup>2</sup> In cases where initiatives have been in place for several years, the counterfactual can be difficult to assess.

being those of focus for the initiatives examined are in fact the most significant amongst those being supplied in the locality by rural land managers.

In many cases it seems likely from the accounts presented in the case studies that the key actors are not particularly troubled by this. Building agreement about a direction of travel, and in some cases a set of activities, often on a contractual basis, is in itself a key outcome and in some cases, it can be established with a reasonable degree of certainty that some land management practices are more effective at delivering a bundle of environmental and social benefits than others. While changes in the physical or human environment might be the clearest indicator for success, in most case studies a sense of achievement/progress might be more important to many of the stakeholders in the shorter term at least. Many of the case study initiatives studies report such satisfaction or progress towards it.

Policy design should recognise this and be realistic about what data is currently available in Member States and at EU level. It may be necessary to find the right balance between having a focus on results-based policies and those policies promoting land management as being more simply an indicator of the right direction of travel.

***Emerging finding 7: The participatory approach alongside the systems framework used in the project (in particular in the case studies) has proven to generally be a useful method to capture the multiple interactions taking place between drivers, actors, practices and the outcomes delivered. It has nonetheless some limits.***

PEGASUS is a participatory research project which seeks the active engagement of stakeholders throughout the project. This has been applied in all strands of the project. The approach has been found to be particularly helpful in the case study work where the team has engaged with a broad range of stakeholders, including farmers, foresters and other rural actors. The networking and knowledge exchange between stakeholders taking place as part of the case study activities in PEGASUS even brought about interesting developments in some of the initiatives studied.

PEGASUS has also chosen to apply a systemic approach to better understand the linkages between drivers, actors, practices and the range of outcomes delivered. The rationale for using a “Social-Ecological System (SES) framework” was to be able to assess the health and resilience of systems as a whole, i.e. considering human and social capital alongside natural capital while embracing economies and the wider environment within which EU farming and forestry operate (see also Annex 3).

In the case studies, the understanding of what environmental and social benefits might be sometimes differed amongst stakeholders. This was not always well delineated in the framework. There are other limitations, such as the lack of suitability for initiatives or systems operating across large territories or initiatives with no specific geographical focus. The Social-Ecological System framework was also found to be sometimes too static due to the limits in its ability to capture the time dimension and the dynamic nature of relationships between drivers, actors, practices and benefits potentially delivered in the system.

Nonetheless, this framework has been helpful to capture the multiple interactions taking place between drivers, actors, practices and the outcomes delivered. The framework in some cases has been a useful support tool for discussions and enabled stakeholders to widen their perspective and understanding of the relationships between the different elements of the system.



### Annex 1: Map of the 34 PEGASUS case studies



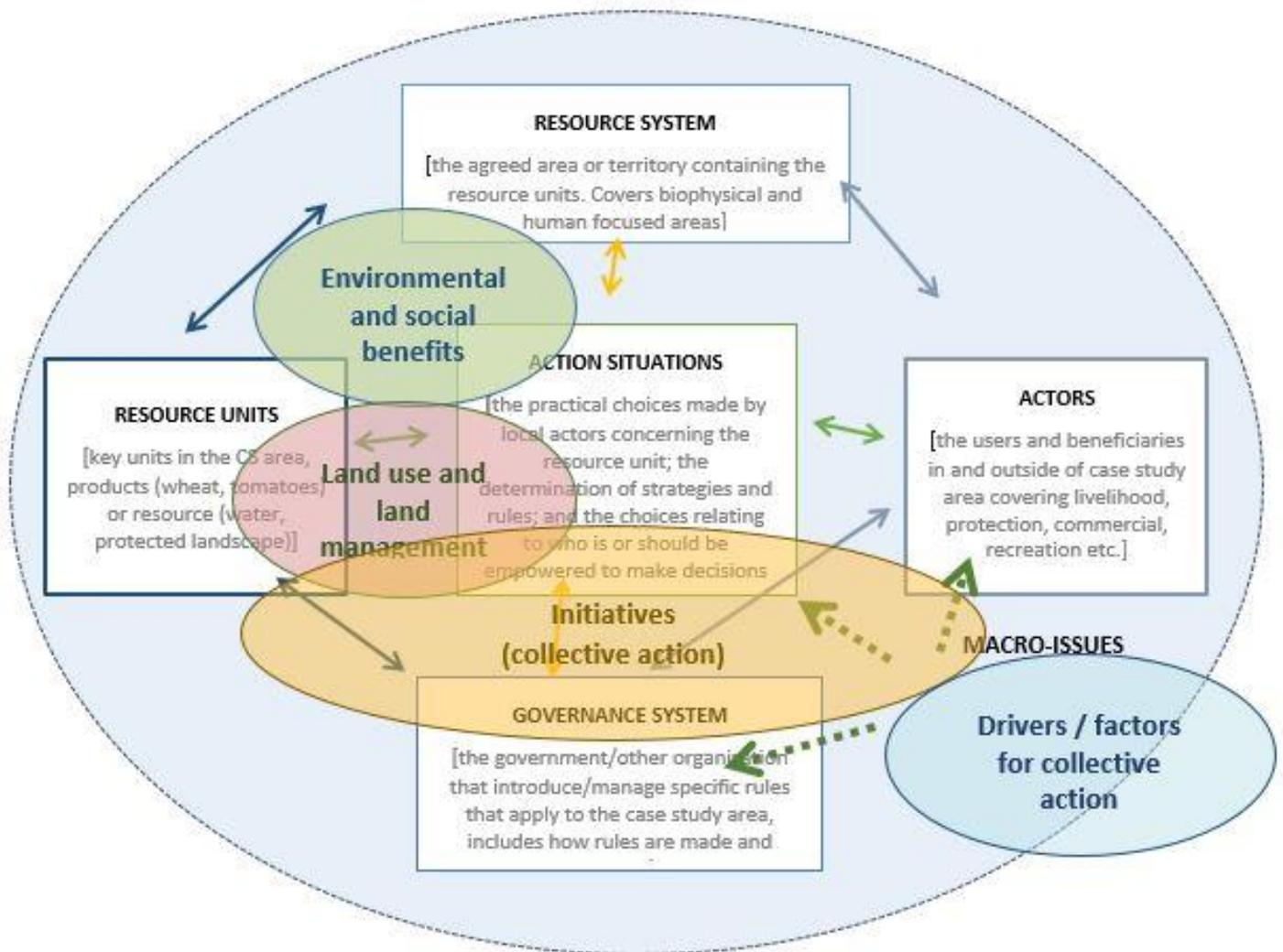
See the table below for a more detailed description of the case studies. For a full description, please see <http://pegasus.ieep.eu/case-studies/list-of-case-studies>

Case study code	Title of the case study
AT-1	Organic farming label in the mountain Murau region
AT-2	Social-Ecological Systems in the Biosphere Reserve Lungau (Salzburg region)
AT-3	Mountain forestry and public goods provision in the mountain Pinzgau area
CZ-1	Biodiversity rich meadows payments
CZ-2	Birds and amphibians support on wet meadows
CZ-3	Letting forests to natural regeneration in the Liberec region
DE-1	GrünGürtel Frankfurt (Green Belt Frankfurt)
DE-2	Traditional orchard meadows in Hessen/Baden-Wurttemberg
DE-3	"Regionalwert AG" Freiburg
EE-1	Marketing of local, organic and farm food
EE-2	Organic grass-fed beef label
EE-3	The Estonian State Forest Management Centre
FR-1	Agriculture and forestry in Pays de Langres
FR-2	Volvic water company
FR-3	Agriculture and forestry in Parc National des Cévennes
IT-1	Processed tomato supply chain in the Tomato District of northern Italy
IT-2	Bergamot, niche and organic products in Calabria
IT-3	Agriculture in natural parks in the Marche region, Italy
IT-4	Niche products and tourism in Tuscany
NL-1	Outdoor grazing payments in dairy farming
NL-2	Farmer, beer and water – sustainable agriculture and sourcing in Noord-Brabant
NL-3	Nature management and regional planning in Drenthe
NL-4	The Skylark foundation
PT-1	Montado extensive silvo-pastoral system in Portugal
PT-2	Small scale peri-urban mosaic in Montemor-o-Novo
PT-3	Intensive olive production in the Alentejo
SI-1	Agro-forestry in sub-alpine Slovenia (Upper Savinja Valley)
SI-2	Managing recreation in urban forests (Celje, Ljubljana)
SI-3	Agriculture-based development strategies for areas hit by economic crisis
SI-4	Nature conservation enabling social security in farming in Središče ob Dravi
UK-1	WILD river basin management initiative
UK-2	Hope Farm - intensive, sustainable arable farming in the east of England
UK-3	North Pennines multi-stakeholder partnership for sustainable uplands
UK-4	Care farms

## Annex 2: List of environmental and social benefits of focus in PEGASUS

Broad categories of objectives to be achieved:	Environmentally and socially beneficial outcomes - ESBOs - [and dominant dimension]
Sustainable and sufficient production of food, timber and energy	1. Food security in the sense of maintenance / increase of a sustainable resource base, as a means to secure the long term capacity of the land to produce food/fibre, etc.
High water quality and ensuring water availability	2. Water quality: Achieving (or maintaining) good ecological status of surface water and good chemical status of groundwater
	3. Water availability: Achieving (or maintaining) a regular supply of water (i.e. avoidance of water scarcity)
High air quality	4. Air quality: Achieving (or maintaining) minimised levels of harmful emissions and odour levels
Climate change mitigation objectives	5. GHG emissions: Achieving (or maintaining) minimisation of greenhouse gas emissions
	6. Carbon sequestration/storage: Achieving (or maintaining) maximisation of carbon sequestration and storage
Climate change adaptation	7. Fire protection: Achieving (or maintaining) a high level of prevention and minimisation of impacts of potential fires
	8. Flood protection: Achieving (or maintaining) minimisation of impacts of potential floods
	9. Soil functionality: Achieving (or maintaining) good biological and geochemical condition of soils
	10. Soil protection: Achieving (or maintaining) minimisation of soil degradation
High levels of biodiversity	11. Species and habitats: Achieving (or maintaining) the presence of diverse and sufficiently plentiful species and habitats (ecological diversity)
	12. Pollination: Achieving (or maintaining) high levels of pollination
	13. Biological pest and disease control through biodiversity: achieving (or maintaining) high levels of biological pest and disease prevention and minimisation of the impacts of potential outbreaks using biodiversity
Protecting landscape character and cultural heritage	14. Landscape character and cultural heritage: maintaining or restoring a high level of landscape character and cultural heritage
Public recreation, education and health	15. Outdoor recreation: Achieving (or maintaining) a good level of public access to the countryside to ensure public outdoor recreation and enjoyment
	16. Educational activities: Achieving (or maintaining) a good level of educational and demonstration activities in relation to farming and forestry
	17. Health and social inclusion: Achieving (or maintaining) an appropriate level of therapeutic /social rehabilitation activities in relation to farming and forestry
High levels of farm animal welfare	18. Farm animal welfare: achieving (or maintaining) the implementation of high farm animal welfare practices on farms
Preserving and enhancing rural vitality	19. Rural vitality: Achieving (or maintaining) active and socially resilient rural communities

**Annex 3: Main components of the Social-Ecological System (S-E-S) framework used in PEGASUS and overlay of key PEGASUS concept terms**



Source: PEGASUS project, adapted from Ostrom and Cox 2010; McGinniss and Ostrom 2014