



Contract no. 633838

PROVIDE

PROVIDing smart DELivery of public goods by EU agriculture and forestry

Call identifier: H2020-ISIB-2014-2; Topic: ISIB-01-2014

Funding scheme: Research and Innovation Action (RIA)

Deliverable **D2.2**

Conceptual paper on the 'unpacked' notion of public goods

Final version: 04 July 2017

Start date of project: 01 September 2015

Duration: 36 months

Organisation name of lead beneficiary for this deliverable:

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Section 4 is based on interviews carried out by the following partners: UNIBO, ZALF, BOKU, VU, UCO, JHI, INRA, LUKE, TLU, UAIC, IAE, UNIWARSAW, TC AV CR

Project funded by the European Commission within the Horizon 2020 Programme (2014- 2020)		
Dissemination Level		
PU	Public	X
PP	Restricted to other programme participants (Including the Commission Services)	
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CO	Confidential, only for members of the consortium (Including the Commission Services)	

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List of acronyms

CAP – Common Agricultural Policy

CSR – Case Study Region

EU – European Union

GHG – Greenhouse Gases

AKIS – Agricultural Knowledge and Information Systems

1 Introduction

This report explores the different notions and issues of public goods, one the one hand as this is treated in the literature, and on the other as this is understood by key stakeholders (representing policy, agriculture and forestry sectors). Although the term public good has a precise meaning in economics discourse, it is also used in lay discourse and some socio-political discourses to describe something rather different to the narrower economic definition, including political aspirations of what is good or should be provided, or ensured, by the state. In this paper, we first explore the definitions and characteristics of public goods based on literature not only from the field of economics, but also more widely from the social sciences. This includes the notion of public goods as states of being or political aspirations. We then focus on the public goods and bads from agriculture and forestry systems and explore some of the conceptual and theoretical questions which have been raised in the relevant literature to date. This is followed by findings from preliminary interviews on the same topics, conducted across different case studies in the European Union (EU). This empirical work was subsequently expanded in Deliverable 2.3 'Guidelines and report on initial interviews and workshops' as part of the 'unpacking' of the notion of public goods and co-construction of the research process. The rationale for this report is given by the paradigm shift in the management of agriculture and forestry systems, from a broadly productivist model, to a wider and more encompassing view of the role of farming and forestry. In the context of the EU, this shift has been parallel to changes within agricultural and environmental policy, reflecting first the need to boost food production and economic growth, the resulting environmental degradation and lack of attention to other elements of the rural landscape and the subsequent goal of devoting more resources to improving public goods from agriculture and forestry systems while reducing the bads.

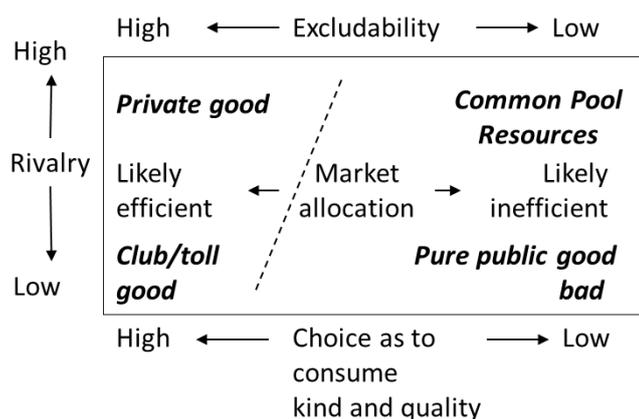
This report has been produced within the context of the EU Horizon 2020 project PROVIDE (PROVIDing smart DELivery of public goods by EU agriculture and forestry). The objective of the project is to provide a conceptual basis, evidence, tools and improved incentive and policy options to support the 'smart' provision of public goods by EU agriculture and forestry systems, in the light of trade-offs and conflicts brought about by prospective intensification scenarios, using a transdisciplinary approach. This report serves as a basis for the next phase of the project by setting the stage for co-constructing a more nuanced understanding of public goods and bads together with stakeholders. This is made possible through mapping and valuing this more nuanced understanding in the context of agriculture and forestry systems and by assessing delivery mechanisms and designing smarter delivery means.

2 'Meanings' of public goods

2.1 DEFINITIONS AND CHARACTERISTICS OF THE ECONOMIC NOTION OF 'PUBLIC GOODS'

The classic economics definition of a public good (or bad) is a good or service characterised by non-rivalry and non-excludability (Samuelson, 1954; Buchanan, 1965; Ostrom and Ostrom, 1977, 1997; Cornes and Sandler, 1996). Non-rivalry implies that one person's consumption of the good does not preclude another person from consuming it. Non-excludability means that no-one can be excluded from consuming the good (or that it would be too expensive to prevent the consumption from other agents). Although non-excludability and non-rivalry are seen as linked to the inherent characteristics of goods, in practice there are often degrees of rivalry or degrees of excludability and these are necessarily contingent on institutional arrangements and are not necessarily fixed over time. In addition, public goods (and bads) are also characterised by the lack of choice individuals often possess on whether or not to consume them (Ostrom and Ostrom, 1977). Often this diversity of outcomes in terms of degrees of 'publicness' is expressed in a simple matrix (see figure 1). As shown in figure 1, some goods are non-rival in consumption, but there are elements of excludability. These are termed club goods as people can club together to provide them and/or collectively derive benefits, whilst excluding those who will not pay or contribute to the good. Other goods are rivalrous in consumption, but have low degrees of excludability. These are common pool resources, such as fisheries or forests. The term quasi-public good, or impure public good, is often used to describe goods or services which have some but not all attributes of 'publicness'. Public goods of a particular type can co-exist with private or club goods as is often the case for environmental public goods (e.g. agrobiodiversity).

Figure 1 - Classification of economic goods



Source: based on Romstad et al. (2000) and Ostrom and Ostrom (1977)

What is excludable and non-excludable is generally framed by the 'technology' of exclusionary devices and the bundle of property rights and laws which are subject to spatial and temporal variability (Schlager and Ostrom, 1992; Ostrom, 2003). Excludability also depends on the resource characteristics, such as the size of the resource, mobility (e.g. fish vs. trees) and the clarity of boundaries (Schlager et al., 1994; Ostrom, 2007, 2009). Excludability has also been related to different types of collective action problems (Ostrom, 2003). The fact that public goods and bads are not subject to exclusion creates a situation in which the market cannot price

these goods efficiently and therefore will fail to meet the demand for them. Public goods and bads are thus generally classified as market failures (Randall, 1983), and under these circumstances, some form of government intervention or collective action has been justified (Cooper et al., 2009). As public goods' production depends on multiple non-coordinated private decisions, public intervention is needed to overcome public goods' underprovision. There are many possibilities for states or local communities to coordinate agent actions in order to increase the public goods' provision: financial incentives (e.g. taxes or subsidies), legal regulation, promotion of collective schemes, payments for environmental services, etc. Depending on the targeted public good's characteristics, intervention may be more efficient through either local (e.g. water supply) or global (e.g. carbon sequestration) schemes. As the objective of public intervention is to attain a better social equilibrium (under the Paretian view), the regulator has to know the good's value for society in order to mobilized the right amount of public money and to promote the right schemes.

Public goods and bads are a special type of market failure termed 'an externality' or 'externalities', where the actions of an economic agent affect the utility or production functions of another agent without permission or compensation (Buchanan and Stubblebine, 1962; Baumol and Oates, 1988). Externalities can be positive or negative depending on their effect on the utility or production functions. A classic example of a positive externality is that of the apple orchard and the apiary, where the owner of the apple orchard provides pollen for the bees and the owner of the apiary provides pollinating services to the apple orchard. An example of a negative externality is that of discharging pollution into a river used for recreational purposes. These two examples illustrate the connection between the concepts of public goods and bads, and the notions of positive and negative externalities respectively.

As the work of Musgrave (1959) and Ostrom and Ostrom (1977) argue, the problems with public goods largely occur in relation to the organisation of collective consumption. An individual maximising the private benefits from what is freely available will have little incentive to contribute to the provision of, or pay for the benefits received from, public goods. This 'free-riding' behaviour will lead, in the short-run, to the undersupply of public goods through voluntary efforts (Olson, 1965). However, Ostrom's work (1990; 2005; 2010) has also shown that in many cases individuals are able to self-organise and overcome the collective action problems associated with public goods and common pool resources. Ultimately the success of these actions will depend on the development of common-property institutions adapted to the specificities of the complex social-ecological system (Cole et al., 2014).

Property rights regimes also affect the way the provision of goods is governed. The basic assumption from economic theory is that when property rights are clearly defined the market will be able to allocate goods (and bads) efficiently. This assumption underlies Coase's (1960) postulate that the initial allocation of property rights does not make a difference, and a social welfare optimum may be achieved through bargaining, when there are no impediments to buying and selling property rights. However, as the institutional economics literature has shown (North, 1990; Williamson, 2000), transaction costs and other trade impediments do matter and, therefore, the initial allocation of property rights and the design of institutions do make a difference. In their work on common pool resources, Schlager and Ostrom (1992) also showed that property rights are better understood as a bundle of rights, including the rights to access, withdraw, manage, exclude and alienate resources. In this respect, well-defined property-rights and rules might enable common pool resource and public goods to operate, in practice, more like private or club goods, and thereby to overcome the problem of 'market failure' or collective action (Ostrom, 2003; Cole and Ostrom, 2011; Cole et al., 2014).

Public goods can also be provided at different spatial and temporal scales. Some public goods are produced and consumed at the local level, but have also implications at regional and global scales when aggregated, e.g. landscapes contribute to society's well-being through local recreational activities and to climate stability through carbon sequestration. This spatio-temporal dynamic is important for the measurement and management of public goods and bads and has already been incorporated into some EU policies, such as the

Habitat and Water Framework Directives (Fisher et al., 2009). In addition, people might perceive and attach different values to public goods and bads depending on the scale of the provision (Hein et al., 2006). A key element in this regard is whether both supply and demand match across time and space. As discussed later in section 3, there are a range of economic instruments for coordinating and matching supply and demand.

Many public goods are supplied as a result of, and through, co-products from the production process. That is, the public good is co-produced along with another type of good due to technical, financial or strategic reasons (Romstad et al., 2000; OECD, 2001). Co-production can be competitive, complementary or joint. Competitive (complementary) production occurs when the production of one good decreases (or increases) the production of the other good. A typical example from agriculture is the complementary-competing relationship between cultural landscape and agriculture (Romstad et al., 2000). In the forestry case, this is illustrated by the trade-offs and potential synergies between forest biodiversity and scenic values perceived by visitors (Horne et al., 2005). Compared to competitive or complementary relationships, joint production originates from a technical process and takes place when the production of one good involves the simultaneous production of the other good. That is, the production of one good always entails the production of the other good. Crop rotations illustrate this type of complex relationship. Legume cultivation may contribute to the production of wheat through improved soil fertility. Improved soil quality serves as the joint product from legume cultivation, while the production of legumes and cereals can be framed as a complementary relationship until reaching a certain threshold above which it becomes a competing relationship.

2.2 STATES OF BEING AND POLITICAL ASPIRATIONS AS PUBLIC GOODS

Both in lay discourse and in some socio-political discourses, states of being or outcomes associated with the delivery of core values are often seen as a type of public good. For example, Cooper et al. (2009) include a list of the main public goods provided through agriculture in the EU, highlighting the distinction between environmental and social public goods. While environmental public goods, such as water quality, climate stability and soil functionality, are closer to the economic definition of public goods, social public goods, such as rural vitality and food security, are better aligned within the socio-political notion of public goods. Dwyer et al.'s (2015) paper also highlights states such as food security and rural vitality as public goods from agriculture and forestry systems. Equally, water and energy security, urban vitality, good/active citizenship, sustainability, etc. are socially shared values about desired states of being but this does not make them (or food security or rural vitality) public goods or services *sensu stricto*. Indeed, they are societal aspirations and, if achieved, represent socially and politically desired outcomes. In addition, given that governments are, in a sense, guardians of a suite of socially shared values, they are faced with making trade-offs in their decision-making around which socially shared values should take precedence at any point in time or over a certain space. Lyon's (2010) report stresses that food is one of the most important public goods and recalls that EU Common Agricultural Policy (CAP) will need to respond to food security challenges in addition to securing the provision of other public goods and reduction of public bads (see also IEEP (2010)).

The above policy outcomes or states of being or socio-political desiderata often arise where bundles of public goods contribute alongside private goods and club goods to outcomes related to broadly shared social values such as water, food and energy security and healthy lifestyles. These states of being arise either because of the interaction of public and private goods (and potentially club goods and common pool resources) and may be motivated by both individual and collective action, often in association with public bodies. For example, reduced fire or reduced flood risk often arises as a result of public or private actions and practices (e.g. the collection of dead wood or cutting residues from forests). Such actions if carried out by individual forest

owners can be seen as private benefits that also deliver positive externalities which beneficially affect other groups, usually in spatially bounded sites. Neighbouring forest owners will also be less at risk because of such actions. In this respect, the outcome from those private actions delivers value to society, including other forest owners, in a non-rivalrous and non-excludable way and therefore could be also framed as a public good.

Table 1 shows the link between some of these socio-political aspirations and different types of goods. Food security can be regarded as an example of public good from a socio-political perspective. However, one could also argue that for food security to be achieved other types of goods are required, such as, private goods (e.g. food, transport), products derived from common pool resources (e.g. fisheries or water) and public goods (e.g. farmland biodiversity). It is therefore the combination of different types of goods along with other elements, such as institutions, capabilities and power, which contribute to food security. In this regard, although the neoclassical definition of goods overlaps with the socio-political approach to ‘public goods’, it provides a narrower definition of public goods. However, the economic theory of goods provides a framework for considering how different goods ultimately contribute to socio-political aspirations. In this respect, the narrower definition might allow for a more concrete design and the testing of novel governance mechanisms. However, the analysis of explicit public good delivery mechanisms might require a further socio-political assessment in order to take the wider societal aspirations into account.

Table 1 - Selected socio-political desiderata and contributing bundles of goods

State of being / socio-political desiderata	Contributing private good	Contributing CPR goods	Contributing public / club goods	Laws and public policy
Food security	Food products	Fisheries	Biological diversity, Soil fertility, Water quality	Farm income support, Food waste laws
Energy security	Energy supply	Primary resource (water, oil)	National grid (often privatised)	Regulatory controls, Tax breaks
Water Security	Privatised supply infrastructure	Water	Supply infrastructure	Water Framework Directive, Water laws

Note: the list provided in Table 1 is not exhaustive

2.3 EVOLVING FRAMINGS OF PUBLIC GOODS

As implied earlier, the framing of public goods has evolved over time from a strictly economic notion of public goods towards a term that for some people now includes broader categories such as rural vitality and food security. Those aspirational statements of public policy desiderata may come from many different sources and this will have implications for what to support publicly and by what means. For example, the protection of sectional interests is sometimes framed around a public good argument. Many authors (e.g. Self and Storing, 1962; Olson, 1965) point to the capacity of farmers to rather effectively rent seek in western democracies, although in the last 20 years environmental coalitions have also become rather effective at this (Winter, 1996). Schneider and Ingram (1997) describe a process where powerful interests can distort policy making in favour of narrow sectional interests through what they phrase as ‘degenerative policy designs’. Schneider et al.’s (2014) Social Construction Framework suggests that policy designs shape social outcomes and usually reproduce the prevailing institutional culture and power relationships. In addition, other theories of the policy

process (for an overview see Sabatier and Weible (2014)) may be relevant to understand how different agendas are set and stakeholders try to influence policy making. Arguably the pursuit of any aspirational public good needs to be critically analysed as to how the concept is framed and how discourses have evolved, to what extent the good is of public nature, and whether the framing is a mask for sectional self-interest.

The competing framings of public goods have implications on who benefits and who pays for their provision. Where a public good or bad argument is accepted, it is often associated with policy to enhance the provision of the good or reduce the supply of the bad. This will impact on land managers and users. Equally, over time there may be changes in the framings of public goods and bads, potentially reflecting changes in public values (or those of particular interest groups) and thereby influencing policy outcomes and distributional impacts.

3 Public goods and bads from agriculture and forestry systems

3.1 CO-PRODUCTION AND THE MULTIFUNCTIONALITY OF AGRICULTURE AND FORESTS

The notion of public goods and bads in the context of agriculture and forestry systems is often linked to the concept of multifunctionality, which acknowledges ‘the simultaneous consideration of the various positive and negative effects of agriculture, and their joint production, externality and public good aspects’ (OECD, 2001). As previously mentioned, while some kinds of public goods are produced in systems explicitly designed for their provision (e.g. health care and public infrastructure), others can be seen as co-products of systems with the primary aim of the production of private goods. This is the case with public goods from agriculture and forestry, at least in the context of most market systems. As outlined in section 2.2, the concept of multifunctionality comprises the provision of different goods and services by agriculture and forestry systems. In this regards, while some goods could be classified as public goods by their economic nature (e.g. agro-biodiversity) others might be closer to a socio-political aspiration (e.g. food security).

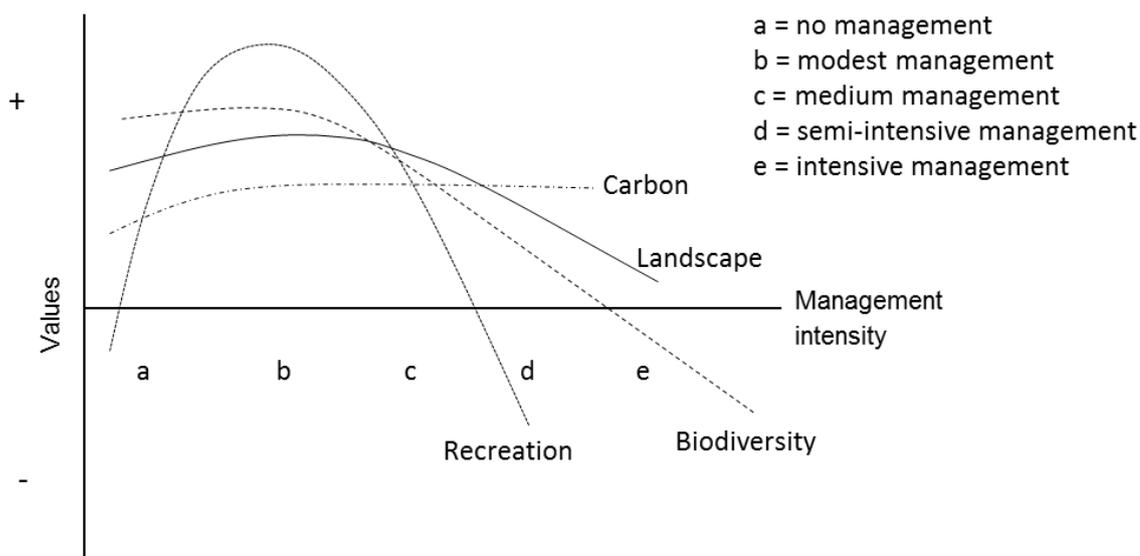
The production of the (normally) private goods can also embrace aspects of public goods, for example where the production of particular agricultural products or particular agricultural systems and the landscapes they produce, are a part of the local identity. One type of public good that has occasionally been asserted is that of rural culture itself. Rural areas are often associated with distinctive cultures. Farming in particular is often seen as a repository of these distinctive local cultures. These cultures find expression in food, farming practices, language (dialect and patois), music etc. It is a moot point as to whether they are public goods *sensu stricto*. However, the EU has often made a great play on the importance of diverse European rural cultures in underpinning rural development, in creating diversity of cultural landscapes and practices, and in contributing to agro-biodiversity. It is difficult and challenging to draw a line between the purported public good of rural culture and the products such as local value added foods and cultural landscapes which comprise the private and public good outputs of that culture. Thus, despite being difficult to measure, rural culture associates with a mix of private and public goods which, in some cases, can be transformed into private benefits. This also relates to the above idea of socio-political aspirations.

Rural land management units often create environmental services in bundles rather than as differentiated services. For example a mosaic of hedgerows and boundary trees around fields creates a mix of visual landscape, habitats and stock protection, and at the same time impact on runoff and affect water quality and volume. A buffer strip to protect water quality is also a carbon sink and an ecological corridor. Even though there may be a singular primary objective, the policy may have impacts in other arenas too, as is reflected in the new evaluation procedures for Pillar 2 where it is anticipated that secondary effects will arise. These weakly separated bundles of environmental services may well not be perceived by beneficiaries as separate services: they may well comprise a holistic bundle of services seen as a composite.

Joint production of public and private goods has previously been shown to be related to the intensity of the production system and is often characterised by a bell-shaped relationship with production intensity (Romstad et al., 2000). That is, at low levels of agricultural production, the provision of public goods is also low, increasing in a complementary way until a threshold at which the relationship turns competitive, resulting in a reduction of public goods (or increase in public bads) (Romstad et al., 2000; Zasada, 2011). However, this might not always be the case in forestry systems, as forest biodiversity generally declines with timber production. In addition, active forestry may contribute to carbon sequestration in a joint production manner

but the relationship between landscape values and timber production will likely depend on an individual's perception, where, and what (i.e. in some cases opening the scenery by removing trees is seen as good, but in some cases a clear cut view is considered bad). As elaborated in the next section, thresholds may also vary across regions and practices depending on land characteristics and the biophysical setting. However, strong evidence indicates that over time the simplification and intensification of forestry and farming systems has reduced biodiversity, landscape values and water quality (Green et al., 2005; Butchart et al., 2010; TEEB, 2010). As figure 2 represents, in general, high intensity land use will be associated with high levels of public bads and low levels of public goods; and in contrast, low intensity land use will be associated with relatively high levels of public good provision and relatively low levels of public bad provision. However, it is highly likely that the relationships are non-linear and highly spatially variable, with perhaps low levels of some public goods arising from very low intensities of use. For example, sheep ranching may deliver a much less attractive landscape than less extensive upland sheep farming with in-bye land enclosed with stone walls and rough grazing further 'up the slope'. So, particularly with landscape related public goods, it may be middle intensity farmland that delivers a mosaic of cropping and grazing that is associated with the highest levels of landscape quality and therefore the highest levels of landscape related public goods.

Figure 2 - Hypothetical generalised public good value curves for rural land use



Although higher levels of intensity use are often associated with a diminution of co-produced environmental benefits, equally, if land is abandoned and de-intensification occurs there are also associated environmental risks. For example, forest fires in the Mediterranean region might well increase with the de-intensification of grazing activity and general neglect of the land. In northern Europe, protected species such as the corncrake (*Crex crex*) may decline as scrub replaces low intensity hay meadows. Indeed, high levels of public good provision will arise in settings which contain iconic species only found within areas of very low intensity levels of management. The desirability of maintaining low intensity farming systems is already enshrined in policy with support for High Nature Value farming.

In addition, it might be argued that at least some of the environmental benefits attributed to land management actually arise because of the lack of management of marginal pieces of land within the farm holding. Such areas, which might include boggy or steep land, are likely to be *refugia* for species that may previously have been far more widespread. They may be a decisive factor in delivering high levels of

biodiversity. Arguably, under the new CAP regime, the designation and protection of such areas under ecological focus areas should provide a degree of protection.

Another type of environmental service benefit arising from farmed and forested landscapes is likely to arise from the presence of these activities within the structure of the landscape - in particular features such as relative relief and water bodies. It is highly likely that mountain farming is valued not just for the hay meadows but also the backdrop of mountain scenery which is more contingent on geology and geomorphic processes than land management practices. Thus, whilst land management practices are often implicated in the delivery of positive and negative environmental services, public goods are also a product of geology, relief and landform which, coupled with land management practices, create variable surfaces of environmental value. Sometimes where low intensity farming is collocated with high levels of relative relief in mountain areas and significant unmanaged pieces of land, the environmental values may be rather high and the disbenefits few. In contrast, in flat landscapes of intensive production, benefits may be rather more modest and disbenefits much greater.

When considering the delivery of multiple public goods, trade-offs need to be taken into account (e.g. Pukkala, 2002). Thus, while intensive farming systems have been associated with a low level of provision of environmental public goods and responsible for the provision of a vast number of public bads, their higher direct contribution to the rural economies has also been recognised, compared to more extensive and lower input systems. Of course, high quality environments may promote the rural economy in other ways, such as through tourism and the residential economy, so there is a need to fully understand the economic value of what might be termed the green infrastructures of productive land use.

3.2 SPATIAL AND TEMPORAL DIFFERENCES IN PUBLIC GOODS AND BADS PROVISION

Public goods and bads change and differ both in time and space both because of differences and changes in practices in agriculture and forestry and because of differences and changes in what people regard as public goods/bads. Intensity of practices influences the delivery of public goods and bads as discussed in section 3.1. In the more productive areas of most European countries, practices have generally moved from being less intensive to more intensive. However, there are also trends towards less intensive production forms or even abandonment of all production where land is of a poorer quality for production (MacDonald et al., 2000). This is often associated with the depopulation of rural space as populations move towards urban centres. The different trends are simultaneously linked to the legacy of historic developments, other drivers of regional prosperity, people's personal aspirations as well as to spatial differences, which influence how economically viable different forms of production practices are at current market prices and levels of public support. Agricultural and forestry practices are also variable over space and time. The outcome of the same practice can thus differ from one location to another (e.g. differences in the leaching of nutrients depending on the slope and soil composition) or differ between seasons and years due to differences in climatic factors (e.g. Di and Cameron, 2002). In addition, historic legacies of previous agricultural or forestry practices may also influence the outcomes of current practices in terms of public goods and bads. For example, the potential of forests to act as carbon sinks has been shown to depend on past management practices amongst other factors (Loudermilk et al., 2013).

In many countries and regions priorities regarding what the general public and policy makers expect from agriculture and forestry have also shifted over time, from a focus primarily on the production of food and materials, to the simultaneous focus on production of amenity and environmental values from agriculture and

forestry (e.g. Marsden, 1999; Schmithüsen, 2007). Nevertheless differences in priorities and perceptions of what are considered to be public goods and bads remain, and their values can partly be linked to regional and national differences in culture, as well as the specific spatial context. For example, even biodiversity-poor woodlands have been shown to have a high amenity value to residents in urban settings (Coles and Bussey, 2000), while this can be expected to be very different for similar forests in 'deeper' rural areas where residents have better access to many other forests.

Different priorities and perceptions of public goods may also co-exist in the same place and time amongst different groups in society. Hence, what is regarded as a public good by some may be regarded as a public bad by others. For example, different preferences for farming landscapes have thus been shown to be linked to individuals' environmental value orientation as well as demographic factors (Howley et al., 2012). Those involved with land management often perceive tidy and productive landscapes as more attractive (Burton, 2004).

Finally, there are also spatial and temporal differences in regulation and policy which influence both the production (by influencing the practices employed) as well as the access to public goods. While some countries such as Sweden, Norway and Scotland have general outdoor access rights also known as 'freedom to roam' in other European countries the public may not have access to privately owned forests thereby limiting the public goods delivered by forests (though some public goods such as carbon storage will still be delivered).

3.3 USING THRESHOLDS FOR INCENTIVES AND REGULATION

There is great uncertainty around the interlinkages between agricultural and forestry activities and how ecosystems might respond to variations in some of its components (Tengö and Belfrage, 2004; Millar et al., 2007; Lin, 2011; Yousefpour et al., 2012). Public good production and the processes behind their provision might be subject to irreversible changes (Touza and Perrings, 2011), meaning that if the system flips to a situation in which additional agricultural and forestry activities negatively contribute to public good provision, it might be difficult, or even impossible, to reverse the process and restore previous levels of public good supply (Gordon et al., 2010; Gao et al., 2011).

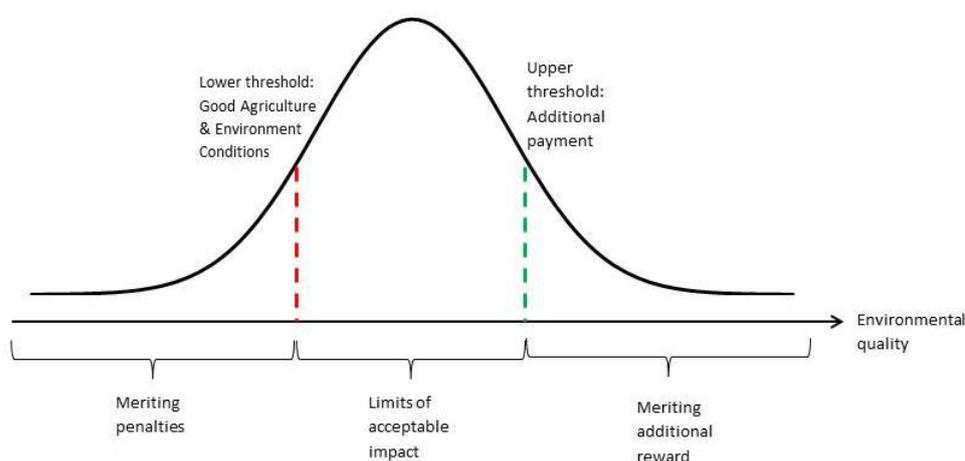
From a policy perspective, major challenges arise in relation to compensating providers for public good delivery and in establishing the boundaries of acceptable behaviour with respect to the provision of goods or the tolerance of bads. Whether in relation to air quality, water quality, biodiversity, landscape or climate change, there are often socially constructed and sometimes legally defined limits as to what is acceptable. These will differ greatly from country to country and may be subject to statutory agreements at local, national or international levels. Moreover, ecological processes related to public goods' provision are often impacted by threshold effects (Muradian, 2001). It is thus crucial for the regulator to take into account these thresholds to promote proper public goods' provision schemes (Dupraz et al., 2009).

With respect to agri-environmental policy, a convention has emerged in European policy that land managers should be rewarded for public goods above a notional, albeit ill-defined, threshold level of provision (see figure 3). The objective of these measures is to compensate farmers for the loss of revenues associated with voluntary public goods provision. Therefore, the EU pays farmers to offset the opportunity costs of conservation of agro-ecosystems. Thus the lower threshold is effectively enshrined in the Good Agriculture and Environmental Condition provisions, and in other obligations such as greening and ecological focus areas defined within the CAP rules, as well as the Water Framework Directive and Natura 2000 provisions. Of course, at any one time, some rural land management units will currently be providing much higher levels of

public goods than others, but this potential imbalance between the provision and reward is currently ignored in the policy process. However, additional payments are routinely made to land managers for environmental actions that exceed an agreed threshold contribution.

This same process of tolerating a certain level of bads is also evident in policy delivery. For example, farms produce quite high levels of Green House Gasses (GHGs) emissions. Indeed, some farms produce very high levels of emissions because of particular soil types, intensities of farming practices etc., but currently there are currently no statutory mechanisms for regulating emissions of GHGs from rural land use (unlike for other major emitting sectors). In contrast, in other environmental arenas, European regulations limit the use of fertilisers in Nitrate Vulnerable Zones and all land managers must comply with the Water Framework Directive. In practice, what happens is that land managers are obligated to meet some environmental regulations, whilst other environmental problems are given rather less attention. And, as a corollary, some additional environmental service provision above a threshold value is rewarded by additional payments.

Figure 3 - Operational rules for land based public good/bads



3.4 OWNERSHIP AND INSTITUTIONAL SETTINGS

The degree of public goods provision by agricultural or forestry systems is often related to particular types of ownership. For example, in cases of community ownership or public ownership the production of private goods such as meat, milk or timber can be of less importance compared to local or national public goods such as the provision of green space, carbon sequestration, or educational opportunities. Similarly in state or municipally owned forests, the responsibilities of public owners to provide e.g. biodiversity or landscape values increase and finding the balance between different products from these public forests can be difficult, but many public owners seek to make 'balanced' decisions which embrace enhanced public good delivery. Furthermore, where land is owned or managed when the amenities of the landscape are particularly important, such as by hobby farmers or private amenity woodland owners, the gap between privately driven

outcome and social optimum of public goods provision is likely to be narrowed. Where land is held by environmental NGOs or Conservation Amenity and Recreational Trusts (CARTs), as Dwyer and Hodge (1996) refer to them, it could be anticipated that their behaviour will accord more closely with socially desired outcomes than the behaviour and practices of self-interested productivist landowners pursuing profit. These organisations are of course the clubs that deliver club or public goods. The existence of such bodies raises the question of how far, through membership contributions and bequests, such bodies can seek to deliver the socially desired outcomes of their members. CARTs can have landscape biodiversity and cultural/historic interests or any combination thereof as their core rationale. In some cases they may be rather singular in their pursuit of a one dimensional objective, such as biodiversity and avoid delivery of other desired public goods. In other cases, NGOs such as the National Trust in the UK may mainstream sustainable land management and deliver high levels of public goods as a result. There is potential for reductions in food or timber supply from land in environmental NGO ownership, which might impact on, for example, rural employment.

In addition, intermediary and bridging actors can enhance coordination of individual action and policy intervention to help cope with differences between social and policy scales, e.g. farm level, municipality level and ecological scales, such as landscape or watershed level (Ernstson et al., 2010; Lefebvre et al., 2015; Schomers et al., 2015).

3.5 THE BIOECONOMY AND PUBLIC GOODS

Alongside the growing interest in public goods, the bioeconomy has emerged as an important part of the framing of a European rural renaissance (Viaggi et al., 2012). The dominant framing of the bioeconomy has been as a means to provide renewable energy and raw materials, including food, into a global economy that has become over-dependent on fossil fuels, including their use as feedstocks into a raft of hydrocarbon-based products, from plastics to fibres (European Commission, 2012a). The European Commission (2012b) states that “the bioeconomy encompasses the production of renewable biological resources and their conversion into food, feed, bio-based products and bioenergy. It includes agriculture, forestry, fisheries, food and pulp and paper production, as well as parts of chemical, biotechnological and energy industries. Its sectors have a strong innovation potential due to their use of a wide range of sciences (life sciences, agronomy, ecology, food science and social sciences), enabling and industrial technologies (biotechnology, nanotechnology, information and communication technologies (ICT), and engineering), and local and tacit knowledge.”

Most framings of the bio-economy have drawn heavily on an advanced biotechnology based notion of the bioeconomy, rather than exploring local and tacit knowledge as is acknowledged in the EU definition. Arguably it is possible to identify a neoproductivist framing and a more eco-economy framing of the bioeconomy. These have been contrasted by Marsden (2012) from whose work table 2 is derived. Furthermore, Marsden and Farioli (2015) point out some discrepancies between the mainstream bioeconomy model framing and some of the central strands of European rural development policy. Schmid et al. (2012) also emphasise the potential of a more bio-economic framing of the bioeconomy as a means for bolstering the delivery of public goods. In contrast, the Federal Ministry of Food and Agriculture in Germany (2014) make no mention of the term public goods in their strategic publication on the bioeconomy.

Table 2 - The bio-economy and eco-economy compared

Dimension	Bio-economy	Eco-economy
Geographical scale	Global national and regional decoupled from local conditions	Regional and local embedded in environmental conditions
Economic model	Economic growth	Steady state small scale economy
Power	Corporate often transnational businesses	Citizen and consumer networks, microbusinesses and co-ops
Driving forces of regional development	Competition clustering and socio-technical systems	Multifunctionality, networks and resilience
Environmental goal	Closed loops of energy waste and minerals and eco-efficiency	Based on ecological principles and natural processes
Social	No or limited connections with local communities	Embedded in local social networks
Urban rural linkages	Connected to metropolitan industries	Connected to rural urban landscapes and consumer networks
Landscape	Eco-industrial sites, agro-parks bio-refineries	Mixed landscapes of production and consumption
Innovation	Knowledge spillovers, technical innovation	Open innovation and ecology based
Regional policies	Free trade, KE and knowledge exchange, redistribution for decongestion	Multifunctionality, new network creation, new interfaces and urban rural connections

Source: derived from Marsden (2012)

The focus, locus of control and industrial structure of the neo-productivist framing of the bioeconomy is potentially antagonistic to the delivery of public goods. For example, intensive maize production or intensive livestock production and use of waste products as a feedstock for biogas may lead to intensive land use with adverse environmental consequences (Herrmann, 2013). In the case of the forest based bioeconomy, the substitution of the biorefinery for pulp production may inject much-needed growth into a declining industry (Hetemaki, 2014) but this may not be without environmental consequences as the current economics of the biorefinery may require a low priced feedstock. Overall, boosting the use of biological resources through a bioeconomy-based strategy might be expected to put more pressure on land for the production of biomass. On the other hand, several key concepts used in the bioeconomy discourse, including technical innovation, waste reduction, resource-efficiency, circular economy, might be expected to contribute to the reduction of adverse impacts on natural resources, at least when considering per unit of product.

The support at EU level for innovation has often been framed in terms of technical innovation. Of course, a prime motivation for the bioeconomy is to address the multiple environmental problems associated with climate change, so even the neo-productivist discourse is arguably rooted within the logical public goods and public bads. However, in relation to public goods and the bioeconomy it is arguably social, institutional and policy innovation may lie at the heart of innovative responses to public goods delivery in the bioeconomy. One way in which public goods may be supported is through Payments for Environmental Services (Jack et al., 2008) and this has been an active area of institutional innovation in recent years. In addition, how to assess trade-offs between different public goods may be a further area for innovation.

While public goods are rarely cited in the bioeconomy literature, there is a growing emphasis on the need for a sustainable bioeconomy, which indirectly highlights concerns for several issues related to public goods. This is clear from the final document of the recent Global Bioeconomy Summit (Global Bioeconomy Summit, 2015) which states that "a sustainable bioeconomy will make essential contributions to achieving the Sustainable

Development Goals (SDGs), as its potentials are particularly geared towards the SDGs related to food security and nutrition (Goal 2), healthy lives (Goal 3), water and sanitation (Goal 6), affordable and clean energy (Goal 7), sustainable consumption and production (Goal 12), climate change (Goal 13), oceans, seas and marine resources (Goal 14), and terrestrial ecosystems, forests, desertification, land degradation, and biodiversity (Goal 15)." Furthermore, some of the key actions to achieve these goals concern new food and sustainable agri-food systems (German Bioeconomy Council, 2015a).

Notwithstanding the potential synergies between the bioeconomy and sustainability, the perception from the scientific community is that, in addition, the relationship between the bioeconomy and sustainability remains ambiguous (Pfau et al., 2014). In addition, most of the bioeconomy-related strategy documents worldwide remain rather sectorial (focusing e.g. on biotechnology or bioenergy), which is less likely to ensure the provision of public goods than a more holistic or landscape-based approach to the bioeconomy (German Bioeconomy Council, 2015b; 2015c).

3.6 ECOSYSTEM SERVICES AND PUBLIC GOODS

Another concept which has gained increasing traction in recent decades and which is of relevance to the topic of public goods is that of ecosystem services. There have been many debates about the exact definitions of ecosystem services, the categories into which they are divided, the roles humans play in creating them and the consequences of framing nature in terms of the services it provides to humans (e.g., Haines-Young and Potschin, 2010; Barbés-Blázquez et al., 2016; Chan et al., 2012; Church et al., 2014; Fischer and Eastwood, 2016; Gómez-Baggethun and Pérez, 2011; Turnhout et al., 2013). While acknowledging the importance of these debates, we will here for the sake of simplicity refer to the definition of ecosystem services by the Millenium Ecosystem Assessment as 'the benefits people obtain from ecosystems' which can be divided into provisioning services (i.e. materials derived from ecosystems, such as food, water, timber, and fibres); regulating services (i.e. processes influencing climate, water flows & quality, diseases, etc.) quality; supporting services (i.e. processes such as soil formation, photosynthesis, and nutrient cycling) and cultural services (those providing recreational, aesthetic, and spiritual benefits) (Millenium Ecosystem Assessment, 2005). From the different categories it can be seen that there is overlap between especially the latter three categories of ecosystem services (regulating, supporting, and cultural) and things and processes which are typically included in notions of public goods. However, provisioning services such as food products would in most situations constitute private goods. Even amongst the other three categories, elements would not always automatically fall into the category of public goods as this would vary with for example institutional arrangements and the level at which a service is used. Recreational services can for example be managed as club goods, where access to recreational areas may be restricted, and supporting services such as soil formation and photosynthesis may be seen to contribute both to the private goods and benefits of the farmers whose livelihoods depend on these services as well as that of the wider public.

3.7 STRATEGIC INTERVENTIONS TO MANAGE PUBLIC GOOD DELIVERY

There are three main types of policy that can enhance the delivery of public goods and limit the delivery of public bads. The first set involves changing institutions and/or property rights; the second uses economic instruments to correct market failure and move outcomes towards a social optimum; and the third involves the persuading of those with the power to reduce bads or enhance goods to do so voluntarily and without financial incentive. They may be used in combination or alone. Each is considered in turn.

Regulatory-institutional-legal

There are several types of regulatory-institutional-legal interventions. Regulations such as the Water Framework Directive or Natura 2000 place obligations on land managers to comply. Such compliance is not underpinned by economic analysis but by a political desire to gain compliance in relation to a specified policy objective. Institutional and legal changes can alter property rights. For example, riparian water use may be restricted by the state when in the past it was a riparian owners right to extract such water as he/she desired. Diffuse pollution is now much more regulated in relation to nitrate and phosphate emissions. This has involved shifting a property right- here the right of landowners to pollute- by a state right to regulate that pollution. Species protection is both a regulation and a shift in a property right, for while a land manager might have been able to neglect a habitat or species in the past, its enhanced status for protection is a de facto shift in a property right in favour of the state.

Many recent property right changes in developed countries favour the state and create powers to limit environmental bads. For example, in many European countries, forest management is heavily circumscribed by state regulations and forestry laws. Some states have, however, altered property rights to make it easier for the land manager to profit from an activity and there has been a recent push in some countries to 'reduce red tape'. A shift in a property right from *allemensretten* and the right to pick wild fruit and fungi to a position where the land manager can sell that right replaces a prior collective right by a private right which can be sold. The state can turn a facility such as a national park which is widely perceived as a public good, into a market good through charging for access. This approach is widely used in the USA.

Sometimes where charging is not allowed for one type of good (say recreational walking), benefit can be derived from a secondary source such as car parking. If there are limited parking places near a public good asset, a landowner can derive benefit from offering and enforcing parking charges.

Cross compliance is used in the CAP to deliver what is regarded as a base level of environmental obligation by the land manager where the state enforces conditionality in relation to another payment, such as the EU Single Payment Scheme. Cross compliance is also possible with grant schemes for new tree planting which can require compliance with specifications such as prescriptions of native tree species, soil protection obligations or specific treatment (usually non-planting) alongside water courses.

Economic

Economic logic in policy design includes the use of the polluter pays principle or the provider paid. These effectively tax the polluter or reward the provider of public goods. Other measures include marketable pollution permits which drive the greatest polluters to adopt negative practices first.

A second type of economically motivated policy can be support for the 'marketising' of public goods by creating a private good. A beautiful landscape may be a public good, but a tourism enterprise overlooking that view may derive benefit from it. Protected Denomination Origin and other regional foods are often considered as means of valorising distinctive environments. Local food is often seen as a means of 'valorising the environment'. Here again the boundary between public and private is complex.

Marketisation or commodification provides a potential means for reducing costs to the state as the creation of new markets through entrepreneurship or new institutional arrangements such as Payment for Ecosystem Services (PES) provide an alternative means of delivering environmental services.

Suasive

Suasive instruments involve the moral suasion of economic actors to behave differently. The actors could be farmers who are persuaded to manage soil better or reduce greenhouse gas emissions. Equally, the actors could be consumers who are persuaded of the benefits of green behaviours.

Where there is a possibility that government will introduce more onerous legislation unless a policy outcome is achieved voluntarily, the carrot voluntary and often collaborative action can be used to fend off the stick of more demanding legislation. Examples in the land use sector include voluntary catchment management groups and local land management partnerships.

In practice, policy instruments are often used together. Suasive action is often used to engender environmental outcomes where there is a legislative back-up. Some elements of EU Pillar 2 policy such as compensation payments have some elements of economic policy logic, but compensate producers for opportunity foregone, not the imputed value of the non-market goods and services they provide. Directives such as Natura 2000 or the Water Framework Directive are typical examples of regulatory policies, but their implementation through Pillar 2 of the CAP, often has some quasi economic measures associated with it.

4 Evidence from PROVIDE interviews

The literature review showed that there are many different ways of conceptualising public goods and the issues related to them. Which definitions are used will influence what is included under the heading of public goods and what are seen as the main issues and potential solutions to deal with problems of under-provision of public goods/over-provision of public bads. It is therefore important not only to know how public goods can be defined in theoretical terms, but also how policy makers as well as people from key sectors dealing with the environment, agriculture and forestry understand public goods and the main challenges related to them. Any proposed solutions to improve the provision of public goods will need to take these perceptions into account in order to be successful. This section summarises the main results from a set of preliminary interviews conducted during August and September 2015 with key stakeholders in the agriculture and forestry sector, including agricultural and forestry advisors, representatives from national conservation organisations and policy-makers. Overall, 24 interviews and two group discussions were conducted in the 13 case study regions (CSRs) within the following EU countries: Austria, Bulgaria, Czech Republic, Estonia, Finland, France, Germany, Italy, the Netherlands, Poland, Romania, Spain and United Kingdom (Scotland). The regions selected were often identified using the existing knowledge and experience of the local research team to select the most appropriate CSR with regards to its levels of public goods and/or public bads and the availability and level of engagement of stakeholders. These early-stage interviews aimed at gathering preliminary views on the notion of public goods, examples of public goods and bads, main issues regarding their supply and demand and mechanisms to promote the production of public goods and reduction of public bads. The data from the interviews, along with this report and existing expertise within the consortium, will be used to inform the next steps of the project through a series of multi-level workshops. Including stakeholders' input in the design of the project and in steering its focus is an important element in PROVIDE's approach based on co-production together with stakeholders. The interviews on which we report here were the first step in this process. Subsequently, workshops were held in the case study regions, where similar notions were discussed in more depth with a wider range of stakeholders. The results of these workshops are provided in a separate report, which constitutes Deliverable 2.3 ('Guidelines and report on initial interviews and workshops') of the PROVIDE project.

4.1 NOTIONS OF PUBLIC GOODS AND BADS

Four main notions arose when the interviewees were asked to define public goods, surrounding ideas of: non-marketability; market failure; externalities and as connected to accessibility and a notion of common property:

- 'Non-marketability' highlights the view that public goods cannot or should not be traded on the market as they do not have a price or cannot be bought. As an example, one Scottish interviewee referred to the landscape as "people don't pay for landscape – it's just there" (Scotland CSR Interview, August 2015).
- Secondly is 'market failure' which highlighted public goods as those which the market fails to provide, as "given the defining characteristics of public goods, their supply cannot be secured through markets... because non-excludability and non-rivalry in consumption imply that users have no

incentive to pay for public goods, often leading to over-exploitation” (Bulgaria CSR Interview, August 2015).

- The third defining feature of public goods identified by some of the interviewees was the externality concept, as some public goods are produced as a side-effect of other practices (e.g. agricultural and forestry practices) such as water quality improvements, flood prevention, scenic landscapes, improving air quality. In other words public goods are “the direct and indirect impacts that the agricultural activities have on the environment” (Italy CSR Interview, September 2015) or “natural processes happening which are highly valuable for people even far away [and] removed from that place...” (Poland CSR Interview, September 2015).
- Lastly is the issue of accessibility which interacts with the tenure system or property rights to provide or manage certain resources, whereby “public goods correspond to common property belonging to all...” (France CSR Interview, August 2015) or “a good that is declared to be property of the state” (Romania CSR Interview, September 2015) or “everyman’s right” (Finland CSR Interview, September 2015).

Interview data were also analysed for any similarities and differences between and across the CSRs. We were particularly interested in any clusters of CSRs to emerge from the data. The responses from the Northern and peripheral CSRs in Finland, Estonia, and to a lesser extent Scotland, can be classified as one cluster as they mainly considered public goods and bads in terms of their accessibility and common (or lack of) property rights. In other words as goods and services to be used by all- e.g., a burden or benefit to society as a whole. Furthermore the interview responses from the Southern countries of Spain, Italy and France, in addition to similarly focusing their responses on the access and property rights aspects of public goods and public bads, also (although France to a lesser extent) conceptualised them as externalities. The central CSR interviews from Austria and Germany also shared a common understanding of public goods and bads as goods which cannot be traded in the market and fail to be provided through the mechanism of the market. Finally the Eastern CSRs interview cluster of Poland, Romania and Bulgaria also all considered public goods and bads in terms of their access and property rights characteristics. In addition, although with less emphasis, these Eastern countries also considered public goods and bads in terms of their externality characteristics. We expected the Netherlands to fit within the central European cluster with Austria and Germany although their interviewee, after highlighting that the concept is not widely used in the Netherlands, focused their response, like many others, in terms of the associated access and property rights. Similarly we explored whether the Czech interviewee responses were similar to the other Eastern CSR responses, however the interviewee did not provide a response to this question. In conclusion, although the clusters are not always well defined or all-inclusive, it is nevertheless interesting to be able to highlight some differences (both spatially and culturally) between the notions of public goods and public bads when comparing across multiple EU countries.

The different definitions that the interviewees associated with the notion of public goods show elements from the economic definition (e.g. market failure or externality), but also integrate aspects which relate more to the socio-political approach (e.g. non-marketability or accessibility). The wider definition of public goods also tends to be more focused on the positive aspects of agriculture and forestry. By this it is meant that the non-economic definitions of public goods tend to highlight the positive aspects, such as free and uncontrolled access. However, the notion of goods as easily accessible and uncontrolled in their ownership or through market-based mechanisms can also have negative impacts or refer to negative externalities, such as pollution or the negative impacts of roaming rights (e.g. various types of erosion, loss of habitats).

4.2 EXAMPLES OF PUBLIC GOODS AND BADS

Table 3 summarises the examples provided by interviewees when asked about the type of public goods and bads provided by agriculture and forestry, as well as the landscape as a whole and other rural land uses (e.g. hunting, recreation, etc.). It is also worth noting that some of the examples given below include public goods according to the economic definition (e.g. climate stability or agricultural landscape), but also other types of goods which would be closer aligned to the economic definition of common pool resources (e.g. water quality and quantity) or private goods (e.g. local food). This could be linked to social and political considerations as to the type of goods that ‘people want for their collective well-being’ (Dwyer et al., 2015). The array of examples given was vast and ranged from examples which appear to be global examples common to all CSRs through to goods and bads which are specific to a single CSR. This could be due to perhaps the current and/or historical agricultural and forestry practices of a particular CSR or its topography, amongst other factors.

Table 3 - Main public goods and bads arising from the initial interviews

	Agriculture examples	Forestry examples	Landscape & other land uses
Public Goods	<ul style="list-style-type: none"> ○ Climate stability and carbon sequestration ○ Agricultural landscapes ○ Farmland biodiversity ○ Food security and local food ○ Water quality/ quantity ○ Rural jobs ○ Scenery ○ Maintenance of the soils ○ Flood/ fire protection 	<ul style="list-style-type: none"> ○ Recreation and tourism ○ Protection from floods ○ Retaining water quality and quantity ○ Carbon storage and emissions reduction ○ Scenery ○ Forest roads ○ Providing shelter for game ○ Protection against erosion ○ Creating biodiversity and habitats 	<ul style="list-style-type: none"> ○ Recreation and tourism e.g. bird-watching, photography, hiking, horse-riding ○ Public paths and access ○ Conservation ○ Cultural value of landscape ○ Wellbeing ○ Maintenance of rural vitality ○ Clean and quiet environment ○ Biodiversity ○ Water quality
<i>Common across all CSRs</i>			

	<ul style="list-style-type: none"> ○ Maintaining cultural landscape/identity ○ Maintaining grasslands/ High Nature Value areas (Czech Republic; Scotland) ○ Favourable weather conditions (Bulgaria) ○ Vineyard preservation (Romania) ○ Wellbeing of farm animals (Romania) ○ Nitrogen deposits (Netherlands) ○ Habitat for nesting Cranes (Germany) 	<ul style="list-style-type: none"> ○ Food gathering e.g. mushrooms, berries (Estonia and Romania) ○ Increased capacity for wind energy (Austria) ○ Wellbeing (Austria; Italy) ○ Hunting- shelter for game animals (Romania; Estonia) 	<ul style="list-style-type: none"> ○ Maintaining forest gene reserve (Finland) ○ Holistic-living environment (Finland) ○ Recreation in waterfalls and bogs (Estonia) ○ PGs from Peatlands (Germany) ○ Natura 2000 areas (Bulgaria)
<i>Specific to certain CSRs</i>			
Public Bads	<ul style="list-style-type: none"> ○ Global warming contribution ○ Reduction of biodiversity ○ Soil erosion ○ Use of fences ○ Pollution from chemicals ○ Poor water quality/ quantity ○ Monoculture landscape 	<ul style="list-style-type: none"> ○ Fires ○ Excessive logging and deforestation ○ Low biodiversity of production forests ○ Pollution of rivers ○ Poor quality waterways and 	<ul style="list-style-type: none"> ○ Air, water, soil pollution ○ Landscape disfigurement ○ Destruction of valued landscapes ○ Waste left by recreation ○ Noise pollution ○ Floods ○ Landslides
<i>Common across all CSRs</i>			

	<ul style="list-style-type: none"> ○ Sewage problems ○ Less diverse range of food ○ Lower cultural heritage ○ Lower scenic value ○ Loss of rural jobs/ incomes 	soils	

<i>Specific to certain CSRs</i>	<ul style="list-style-type: none"> ○ Small, fragmented farms (Bulgaria) ○ Damage to roads and soils by old farm vehicles (Romania) ○ Intensive agricultural chemical use= negative impact on honeybees and biodiversity (Romania) 	-----	<ul style="list-style-type: none"> ○ Loss of recreational areas in the territory (Poland) ○ CO2 emissions (Poland) ○ Threats in the forests such as beasts and predators (Finland) ○ Inappropriate disposal of fallen trees (Romania)
		-----	<ul style="list-style-type: none"> ○ Aesthetically poor buildings (Romania) ○ Access issues from private waterways (Estonia) ○ River barrages hinder fish migration and water-based recreation (Estonia) ○ Loss of cultural identity (France)

As is highlighted in table 3 the interviewees provided a large number of examples of public goods and bads from agriculture and forestry. Some interviewees spoke at a more general level, highlighting goods which were prominent across all / the majority of the CSRs such as recreation opportunities, carbon storage and scenic views. Whilst others provided more regionally specific examples, such as aesthetically poor buildings in Romania and the impacts of river barrages on fish migration in Estonia. However we recognise that although the interviewees offered a great deal of information, the list reported in table 3 is by no means exhaustive. Similarly we accept that some of the regionally specific examples offered are also present in other CSRs (but simply not mentioned in the interviews) or may even be viewed differently by another CSR/perspective such as the perceived value of access rights by tourists and farmers.

In terms of any perceived clustering of responses, these were not as recognisable as when compared to the responses regarding the notions of public goods. The Eastern European cluster of Bulgaria, Czech Republic, Poland and Romania were similar in their focus on more localised and CSR specific answers. Within the Central European cluster of Austria, Germany and the Netherlands there was a focus on carbon storage as well as more intangible public goods such as the role of CSR landscapes in providing tranquillity and well-being benefits to visitors and local residents. In the Southern European CSR the overlap was less evident, although all interviewees spoke of the importance of biodiversity and of the landscape for recreation, and even simply for its aesthetic benefits. Finally the Northern European cluster included a clear distinction between the Finnish interviews which focused more on public goods and bads from forestry and the Estonian and Scottish interviews which focused more on the agricultural side (but this is to a large extent due to the type of stakeholders interviewed within these CSRs). Nevertheless similarities still arose between the Estonian and Finnish interviews as each mentioned food gathering (specifically wild mushrooms and berries) as a public good as well as recreation. Furthermore, there were similarities between Scotland and Finland, as both highlighted food security and the existence of cultural landscapes as examples of public goods. Finally both the Estonian and Scottish interviews emphasised water pollution and nitrate emissions from intensive agricultural practices as common public bads. So overall there are some clusters of responses, although, the majority of these public goods and bads can be found in any of the CSRs.

Due to the limited number of key stakeholders interviewed in this stage of the project, the list provided table 3 should not be seen as an exhaustive or definitive list of public goods and bads in the different regions. For that reason this list was mainly used as a starting point for subsequent discussions and activities in the project, as something to add to, refine and reconsider. Subsequent steps of the project first gathered more input on public goods in the case study regions generally (see Deliverable 2.3, 'Guidelines and report on initial

interviews and workshops’) and then honed in on particular public goods and bads and challenges in relation to them, which were regarded as most prevalent or important in each case study region.

As important, if not more important as discussions surrounding the public good concept or of examples, is a discussion surrounding the production and provision of those goods to which we now turn our attention to.

4.3 PRODUCTION AND PROVISION OF PUBLIC GOODS AND BADS

The interviewees were asked to provide their views on the production and provision of the public goods and bads in their CSRs, with regards to the level of intention behind decisions to produce/provide them (e.g. are the public goods and/or bads in the region a direct result of land management or are they unintended by-products?). The responses differed greatly with some believing that public goods and bads were almost all unintended by-products and others emphasising that they were all a direct result of land management. However the majority of interviewees seemed to agree that public goods and bads were both a direct result of land management but also unintended by-products. This means that the majority of public goods and bads reported in table 3 were produced as a direct result of the intensity, and mix of ways, with which the land was managed, but that this provision was often unintentional as it was not the main product desired from that patch of land. For instance one Scottish interviewee highlighted that although, ‘the main purpose in an upland farm is to produce sheep ... [but the] ... landscape and biodiversity and water quality issues that might be delivered as part of that is unintentional’ (Scotland CSR Interview, September 2015). Similarly one Spanish interviewee emphasised that ‘both public goods and bads are externalities ... they are sub-products not intended by land managers and produced as a consequence of their land management whose only main motivation is private profitability’ (Spain CSR Interview, September 2015).

Although the majority of interviewees framed the production of public goods and bads as a direct result of land management practices as their production is ‘not just an accident’ (Scotland CSR Interview, September 2015), a few instances were mentioned when the production of these goods was intentional, such as in certain systems (e.g. organic farming) or practices (planting hedgerows). Furthermore, one Finnish interview highlighted that in their CSR ‘it is common practice that landowners take voluntarily into account [the] neighbouring environment in managing their land to some extent’ (Finland CSR Interview, September 2015). However, there doesn’t appear to be an obvious distinction between the level of intention between forestry and agricultural systems with both systems directly producing (a particular set of) public goods and bads. Looking once again to the clusters, there doesn’t appear to be any clear similarities/ distinctions in the views within and between the loose clusters, and in fact there even appear to be differences of opinion between interviewees within the same country. This serves to highlight that the views on the level of intention are very context specific. Thus, the specific view of an interviewee/ stakeholder will depend on the type (intensity) of agriculture/forestry they are familiar with. However from the interviews it is clear that the greater the intensity of agriculture/forestry, the greater the level of public bads produced. In correlation, the more intensive areas may also produce a greater quantity of certain public goods, e.g. carbon storage, although other public goods may struggle to be sustained in this same environment, such as biodiversity and cultural heritage.

Furthermore, the provision of public goods and bads can be influenced by incentives and environmental schemes which can alter the provision from unintentional to intentional. More broadly, the motivations of the land managers can have a huge impact on the intentionality of public goods and bads, as the range of motivations discussed in the interviews will now be highlighted in the next section.

4.4 MOTIVATIONS OF LAND MANAGERS

Regarding the motivations of land managers for the provision of public goods (and bads), interviewees identified four main factors which are somewhat interrelated: financial incentives, social norms and peer-pressure, legal obligations and compliance, and intrinsic motivations.

- Financial incentives include both subsidies, such as agri-environmental payments, or other forms of support or taxes (e.g. nuisance taxation). As mentioned in section 4.3 these incentives can have a great impact on altering the provision of some public goods from unintentional to intentional. This is illustrated by one Finnish interviewee here, 'often the motivation comes from the owner's own willingness to benefit from the public good that s/he produces' (Finland CSR Interview, September 2015). These incentives are offered to farmers and foresters in agreement that they increase/reduce their provision of a particular product from their systems in order to increase (or decrease) particular public goods (or bads) in the areas more broadly. However one Scottish interviewee mentioned a perceived flaw in this system, as reducing the production of some public goods through incentives has in some ways only come about in response to the previous subsidies offered by the government, e.g. to keep more sheep (through head age payments) to improve food security, which in turn led to overgrazing of the hills and then to a loss of biodiversity, soil erosion and a loss of aesthetically pleasing land. Although this point may also be linked to the issue that many public goods and bads are intertwined, as it is impossible to provide all public goods on a single parcel of land without indirectly also providing public bads.
- Social norms are, to a large extent, linked to identity issues (e.g. being a farmer) and to the associated practices. For instance, '[Land]owners in general value special places on their land and tend to safeguard those for aesthetic experiences' (Finland CSR Interview, September 2015). This is also related to peer-pressure issues, as '...you know best practice to be shown to your neighbours that you're good at this' (Scotland CSR Interview, August 2015).
- Another motivation are legal obligations and compliance, which involve the use of fines and penalties for landowners and users (if there is no or unsatisfactory compliance), mainly to reduce the levels of public bad production, such as the levels of pesticide use on farms. However it can also refer to restricted usage/access of areas (and penalties for failure to comply with these restrictions) and the collection of fees, as one State owned forest enterprise in Finland 'is starting to collect fees from [users] of forest roads on state land' (Finland CSR Interview, September 2015).
- In relation to intrinsic motivations, interviewees acknowledged the fact that land managers are interested in keeping the quality of the land, simultaneously for financial, personal (e.g. health and working conditions) and reputational reasons. One Spanish interviewee highlighted that, 'once farmers have implemented certain measures due to the requirement to get the subsidy and observe the beneficial effects on the farm (e.g. soil conservation) and/or feel better because they are not "exhausting" natural resources, they tend to maintain those practices' (Spain CSR Interview, September 2015). Furthermore, the Italian interviewee highlighted that 'farmers are motivated to practice sustainable agriculture first by the willingness of preserving their own health and increasing their working conditions and life quality' (Italy CSR Interview, September 2015).

With regards to any identifiable trends from the country clusters in the responses, a few similarities could be recognised. For the Southern European cluster, both the French and Spanish interviewees emphasised subsidies as their main motivator, and the Italian interviewee viewed it as a secondary motivator within their CSRs. Within the Northern European cluster the focus was, especially in Scotland and Finland, more on the

altruistic motivations. The focus in the Eastern European cluster is more closely connected to intrinsic motivations such as financial gains. Finally, in the Central European cluster the focus is predominantly on the financial incentives once again. Although there are also similarities between CSRs outside of their cluster, as for instance, the financial incentives were frequently mentioned as the perceived main motivator for the landowners within quite a few of the CSRs.

4.5 DEMAND AND SUPPLY ISSUES AND POLICY MECHANISMS

We will now highlight the main issues regarding the supply and demand issues for public good provision. Table 4 summarises the main issues related to the demand and supply of public goods and bads.

Looking to the supply and demand of public goods and bads there isn't a great deal of evidence to support clustered responses but nevertheless some issues are more prevalent than others. For instance with regards to the supply of public goods the most frequently cited issues are conflicting objectives and competition over multi-functional land (e.g. conservation/ maintaining biodiversity vs. intensive agriculture). In addition the role of the CAP and payments was also often mentioned as a key issue as they are often the initial trigger used to encourage farmers and land managers to increase the provision of public goods on their land. However there was concern raised by one Scottish interviewee surrounding the timescale of the supply of public goods, as they often require a lengthy investment of time greater than a single incentive scheme or CAP programme. Another interesting point was raised by the interviewee from the Netherlands who highlighted, 'that both public goods and ecosystem services are still very theoretical concepts ... [and] ... it is still very difficult to bridge the gap with governance and a more practical implementation' (Netherlands CSR Interview, September 2015). Turning now to the demand of public goods, the main issues concern a lack of knowledge and engagement from the wider general public and problems with access. In terms of a lack of knowledge, 'society does not know [about public goods] are therefore cannot judge' (Spain CSR Interview, September 2015) which connects to a lack of engagement. A Scottish interviewee highlighted that the lack of engagement is connected to the location of the majority of Scotland's population. As often, public goods are created in rural areas and 'when you think that 80% of the population in Scotland live in urban areas- they probably have a low understanding of the different impacts of farm management on biodiversity' (Scotland CSR Interview, September 2015). However for others this engagement is growing, with the Italian stakeholder highlighting that the desire for sustainably sourced and farmed agricultural products is increasing and 'demand for those products is growing faster than the offer in XX region' (Italy CSR Interview, September 2015). Furthermore, another frequently cited demand issue is access, in terms of restricting the access to, and use of, areas (with a large quantity or quality of public goods) due to property rights, which are often at odds with the open access rights of a country (e.g. Finland, Scotland).

Concerning the supply of public bads, the main issues are the same as with the supply of public goods - competition and conflicting objectives. For example, 'the entry of foreign low quality product at very low prices (e.g. cheese made with powdered milk) induces farmers to reduce the production costs at the expense of sustainability' (Italy Interview, September 2015), and thus at the expense of public goods and towards the gain of public bads. The issue of conflicting objectives is experienced within the majority of CSRs, in terms of the public bads produced as a result of more intensive farming and forestry practices (to either ensure business viability or increased profits). Regarding the demand of public bads, the main issue is again a lack of knowledge or engagement. For example, the general public continue to purchase cheaper agricultural and forestry products, and thus as a side effect, continue to fund the provision of intensive agricultural and forestry practices and the associated public bads. However, 'people will feel very different depending on their

views and how they are affected' (Scotland CSR Interview, September 2015). The majority of CSR interviewees emphasised the importance of various mechanisms that need to be instigated to ensure sustainable levels of the supply and demand of public goods and bads. These will now be discussed.

Table 4 - The supply and demand issues identified from the CSR interviews

Supply issues		Demand issues		
Public goods	<i>Under-provision</i>	Underprovision of some public goods as land is increasingly used for intensive agriculture and forestry for development purposes	<i>Access</i>	Some areas which provide Public Goods (e.g. nice scenery) are inaccessible for the public due to private ownership. Also other areas are too easily accessible (overuse). Some countries (e.g. Finland, Scotland) have an open access policy for walking e.g. everyman's right
	<i>Farmers' attitudes</i>	Fear of farmers of increased regulations to produce/maintain Public Goods	<i>Distribution</i>	Public Goods not always evenly distributed across the landscape. Additionally demands for Public Goods can be unevenly distributed
	<i>Incentives</i>	(Lack of) CAP incentives and forest related subsidies to produce/maintain Public Goods	<i>Awareness</i>	Lack of awareness by the public of the Public Goods and their origins
	<i>Knowledge</i>	Poor/ incorrect consumer awareness of agriculture and forestry issues	<i>Perception</i>	Some Public Goods might be Public Bads for others
	<i>Tenure systems</i>	Impacts on PG supplies from land abandonment and intensification	<i>Public (urban) engagement</i>	Urban residents can be disengaged with the issues that surround agriculture and forestry as they are physically removed from the areas.
	<i>Conflicting objectives</i>	Land has multiple functions, and different stakeholders have different priorities for this land e.g. extensive vs intensive; food security vs conservation which produce/maintain differing levels of Public Goods		
	<i>Cost</i>	Some PGs are costly in terms of set-up costs/ maintaining costs/ loss of income due to ulterior use of the land		
	<i>Property Rights</i>	Issues over the ownership and responsibility of PGs in terms of individual vs. society (e.g. Finland's everyman's rights)		
	<i>Timescale</i>	Some PGs require a long-term time investment (e.g. tree-planting)		
Public bads	<i>Over-provision</i>	Instances of an overprovision of Public Bads to the point of saturation, e.g. an abundance of nice scenery	<i>Trade-offs</i>	Some Public Bads are unavoidable as they are produced/created as a trade-off for another PG
	<i>Incentives</i>	Idea of regulating/ incentivising the land managers to produce fewer Public Bads	<i>Perception</i>	Lack of awareness of consumers of the impacts of Public Bads/ how they're produced

<i>Norms</i>	Locally specific, but refers to idea that Public Bads are produced because that is simply what has always happened e.g. impacts of excessive deforestation
<i>Financial constraints</i>	When land managers cannot afford to change their practices to produce less Public Bads e.g. lower intensity of farming
<i>Cultural barriers</i>	This can relate to a variety of cultural practices which encourage Public Bads e.g. access, management practices, lack of knowledge/ awareness of the impact of practices

From the interviews we have identified four main mechanisms through which the provision and maintenance of public goods can be administered, namely: 1) Agri-environment schemes and other compensation schemes; 2) AKIS (Agricultural Knowledge and Information Systems) and related forestry knowledge systems; 3) Market incentives; and 4) Regulations:

- In terms of using agri-environmental schemes and other compensation schemes, the interviews suggest that these should be co-developed with input from the farmers for their development and delivery. There was a suggestion that ‘the [subsidies] approach could change and be based on farmers’ performance instead of on the implementation of certain practices/measures’ (Spain CSR Interview, September 2015). Concern was also raised regarding the CAP, in terms of a need to be cautious and sensible in its use, ‘because the CAP has such power of manipulation’ (Scotland CSR Interview, September 2015). However the majority of CSR interviewees recognised the importance of the CAP in its role as a somewhat effective alternative to a fully market-driven rural economy (particularly regarding its role in maintaining the provision of PGs).
- AKIS can be utilised better by increasing the opportunities (and platforms) for knowledge exchange, to in turn change behaviours towards improving the provision of public goods. For the Polish CSR ‘the key mechanism is education’ (Poland CSR Interview, September 2015), which applies to both the producers and consumers of public goods and bads. Furthermore, for one Scottish interviewee ‘changing behaviours’ (Scotland CSR Interview, September 2015) associated with public goods and bads is an important mechanism, particularly for reducing bads.
- Market incentives were suggested with reference to (for example) new market-based instruments (e.g. ecolabels, PES) and increasing the payments to farmers that practice sustainable agriculture.
- Finally there were suggestions to regulate the land managers and users vis-à-vis the amount of public goods they use/ public bads they produce as has been utilised previously with the ‘Polluter Pays Principle’.

The Estonian interviewee highlighted that ‘usually the combination of different mechanisms (regulative, economic, informational, and instrumental) have better effects’ (Estonia CSR Interview, September 2015) than maintaining a focus on a single mechanism. Furthermore, the Finland CSR interview (September 2015) suggested that ‘new market-based instruments’ could be useful mechanisms to improve the provision of public goods, however they recognised that this would be, ‘difficult to apply as here there are any stakeholders involved’ (Finland CSR Interview, September 2015), but nevertheless it is a point worth exploring in more detail.

5 Discussion

This paper brings together the economic and socio-political notions of public goods and bads, based on the literature and on interviews with key stakeholders, and examines them in the context of agriculture and forestry systems. It is unsurprising that there is a divergence between the perceptions regarding public goods and bads and the different examples that emerge under the notion of public goods. Thus, the results presented in section 4 show that stakeholders identify a broad number of public goods varying in their degree of rivalry and excludability, and ranging from a more neo-classical economics conceptualization to a wider socio-political one. However, although the wider notion of public goods provides a potential bridging mechanism between the two perspectives, they may also be seen as constructs of sectional interests to maintain, or increase, levels of public support.

Sometimes the wider framing of public goods and their resulting protection may create enhanced opportunities for synergy. Slee (1994) describes a process of secondary marketization, where high quality natural environments provide a foundation for the development of tourism and residential economies as a result of people considering these public goods to be attractive. Furthermore, Slee et al. (2005) assert that the regional contribution of forestry to local economies in some areas is much greater from environmental consumption than from forest-related production. This suggests that there are win-win solutions, but even where these arise there may be some interests that lose out if, for example, sawmill operators are unable to source wood because of greater environmental protection. However, the synergistic effects of environmental quality on economies may not be able to be captured by the provider of the environmental good or service. This may necessitate brokerage by the state to ensure that the resource provider obtains benefit from this provision and that the good or service is not being opportunistically captured by another economic agent.

Regarding their production, public goods may be the result of intended or unintended actions (depending e.g. on the intrinsic motivations of the land manager or existing regulations and incentive schemes), but will in most cases remain subsidiary to the production of private goods. The results presented in section 4 support the idea that although public goods and bads are often the result of direct land management, in most cases they are unintended co-products. Hence, the production of public goods (and reduction in, or prevention of, public bads) from these systems requires either that conditions favour either, the co-production of private and public goods, or a change in the main aim of the system (e.g. forests managed by nature conservation groups with the explicit main aim of biodiversity preservation). In the absence of rewards for public goods or penalties for public bads, private land managers cannot be expected to deliver socially optimal land use. Where landowners have private (or collective) amenity objectives, the gap between private action and social optimum may be narrowed, but in normal circumstances, public goods will be under-supplied and public bads over-provided, as also suggested by the results presented in section 4. Under these circumstances, some kind of intervention is therefore justified.

In addition, it is widely recognised that there will be variations in the importance of public goods and bads over time and space. These variations will be contingent on the specificities of particular socio-ecological systems and patterns of demand, and will be framed by both the ecological relationships of production systems and the property rights and institutional structures. This will lead to hotspots of high provision of public goods and of public bads. Similarly, demand for public goods may also be subjected to spatial and temporal variations, potentially leading to problems of mismatch between the supply and demand of public goods or bads. Arguably, developing workable solutions in the problems of under-provision of goods and overprovision of bads in hotspot areas will provide a set of working models that can be rolled out more widely across rural areas. In this case, if a broader definition or framing of public goods is adopted including socio-political

desiderata, it is important that the policy community is made aware of the possibility of both negative trade-offs and positive synergies. For example, if large areas of semi-natural habitat are conserved, it is likely that food or even energy security could be compromised on that area of land. There is a trade-off which may not be explicit, in which society would appear to be making a decision that biodiversity or landscape conservation is worth more than the foregone contribution to food security. Equally, rural vitality (at least the part driven by productive rural land use), might be compromised by a strict policy of protecting semi-natural habitats. In addition, the wider definition of public goods may bring new challenges on how to value public goods, when so many socio-political desiderata exist. However, although the economic valuation of land use related public goods and bads has advanced considerably, there is still widespread scepticism on whether economic values capture all social and economic values. Indeed, Kenter et al. (2015) argue that 'theoretical and methodological plurality is needed to understand, and account for, the full value of biodiversity and ecosystem services to human wellbeing'.

Trade-offs between different public goods, including socio-political desiderata, will also depend on whether goods are co-produced and the type of relationship that exists between them. As argued in section 2, socio-political desiderata often entail the production and provision of different types of goods, including private and public ones. In these cases, feedback loops may also arise and unravel complex relationships between public and private goods and societal aspirations. For example, landscape aesthetics may attract tourists that provide farmers the opportunity to market local products which, in turn, influence the production systems and strengthen the 'identity of the region'. Spatial and temporal variations may also be related to different management intensities. The results from the interviews coincide in pointing out that greater land use intensity is generally associated with greater levels of public bad provision. However, even when public bads are produced, other public goods may be simultaneously provided. Thus, where there is evidence of bundles of public goods being delivered as co-products of productive land use the clear policy implication is that bundles of public goods which bring multiple benefits may be favoured over those delivering a single good. This requires a systemic analysis of likely impacts as, for example, some species may only survive in narrower niche conditions whilst simultaneously providing a small number of highly valued public goods.

Overall, this paper raises some important questions about the nature of public goods and bads associated with rural land use and particularly intensification processes and how policy might deal with the consequential impacts on public goods and bads. Among the key questions that arise from the conceptual and empirical work are:

- How public goods are conceptualised by different people/ groups of people: to what extent do different groups conceptualise public goods/bads differently?
- How the framing of the idea of land use related public goods and bads has evolved: has the framing of public goods and bads been consistent over time? And what were the triggers to any changes?
- To what extent do the different framings create scope for synergies: does the pursuit of say enhanced food security necessarily compromise other public goods and increase the supply of public bads?
- To what extent can the advancement of bio-economic framings of a rural renaissance for Europe be compatible with the enhanced delivery of public goods and the reduction of public bads?
- How rural land use related public goods and bads are distributed over space: is there a consistent geography of public goods and bads and what are the causal forces behind hotspots of high public good provision and high levels of land use related negative externalities?
- How public goods are created as co-products or in non-productive areas: i.e. Are they directly associated with the productive use of land or a function of the presence of non-productive areas of land within the proprietary unit?

- The extent to which land use related public goods are really land use related and the extent to which they may be contingent on landform, including water and relative relief: are environmental values separable, or does weak separability confound the problem of valuation?
- To what extent can accurate and consistent economic (and other) values be placed on public goods and bads? Given multiple values are often produced, can these be measured accurately and cost effectively? Can trade-offs be made more explicit?
- How European policy currently addresses public goods and what other policy means could be used; given the mix of potential mechanisms are there alternative bundles of policy means which could deliver the public goods, and regulate the environmental disbenefits, more effectively?
- Who utilises the public goods: are they local groups or global groups? And what implications might this have on the ability to organise the supply of public goods through alternative smart means?
- To what extent can a co-construction methodology bring together these divergent views of public goods and bads and create purposive spaces in which smarter solutions for the enhancement of public goods and the mitigation of public bads can be built?

6 Conclusions

There is widespread recognition that agriculture and forestry systems are associated with a number of public goods and bads, and that these vary in value over space and time. In addition, there is a general acceptance that these public good values have become more important over time, largely as a result of rural land use intensification, and in some other cases in association with a simplification of land use systems.

There are however, some wide conceptual variations in what is considered a public good. These definitions include a narrow economic definition and a much broader definition which combines lay and socio-political discourses. The interviews, conducted in the context of PROVIDE, show that different notions of public goods emerge from different stakeholders and that these may also differ between regions. Policy is necessarily built on particular conceptions of public goods. Furthermore, policies are framed on different notions and with different intentions. As a result of the prevalence of significant public goods in the rural land use sector, by whatever definition is used, there are likely to be different rationales for policy. In particular if the narrow notion of public good is used, policies to address externalities tend to come to the fore. In contrast, the wider public good idea of -for example- food security and perhaps more debatably rural vitality are more likely to engender policies which are more supportive of productivist or intensive land use.

PROVIDE's epistemological framework based on co-construction and continuous engagement with stakeholders aims to recognise the legitimacy and value of alternative constructions and framings of public goods and how actual praxis may differ from economic theory. Recognition of these differences is the first stage in exploring the scope for reconciliation and bridging, with deliberative and dialogical approaches providing an opportunity for enhanced mutual understanding (and potentially changes) in the framing of problems which enhances capacity of leading to new and smarter solutions for the provision and governance of public goods and bads. The interviews with key stakeholders reported on here and compared to the literature, provided the first step in this process. Subsequently, workshops were held in the case study regions to include a larger number and wider variety of stakeholders and their views in this process. The results from these workshops are reported on in PROVIDE deliverable 2.3 ('Guidelines and report on initial interviews and workshops').

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