BIOGEA

Testing BIOdiversity Gain of European Agriculture with CAP greening

D2b. Critical implementation aspects for GBI-relevant policies

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Abstract	This deliverable gives an overview of the EU policy framework, examining how ten policy frameworks from a long list of seventeen are of relevance to GBI. The characteristics of policies, likely to contribute to their effectiveness, are assessed as well as their aims relevant to GBI. In addition, stakeholders were engaged through the PRDN to provide feedback on the relevance of the assessed policies and their future potential. A list of GBI features is presented for the BIOGEA project, based on an assessment of the type of features present in agricultural landscapes in Europe, combined with an overview of how these features are included in the EU policies relevant to GBI and a practical assessment of their measurability in the field. This list will be used as a basis for the fieldwork carried out in WP 3. An initial overview of the benefits or disbenefits the features can give for biodiversity and ecosystem services based on a number of meta-reviews is provided. The deliverable ends with a description of how its findings will be taken forward in the other BIOGEA WPs.

Dissemination level of this document

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Table of contents

1 Introduction 4
1.1 The BIOGEA Project 4
1.2 The BIOGEA Assessment Framework 5
1.3 Scope of the deliverable 6
2 EU Policy overview – identifying the GBI aims 7
2.1 Background 7
2.2 Methodology for the EU policy analysis 12
2.3 Results of the policy overview – the GBI aims 19
3 Identifying GBI features included in policy 30
3.1 Background 30
3.2 Methodology – identifying the GBI features and the benefits they provide 32
3.3 Results – the GBI features 36
4 Discussion and identification of critical implementation aspects 58
4.1 Discussion 58
4.2 Critical considerations for the next steps 62
5 Publication bibliography 64
6 Annex 1: Interview timetable 69
7 Annex 2: Minutes from focus groups 70

1 Introduction

1.1 The BIOGEA Project

The project Testing BIOdiversity Gain of European Agriculture with CAP greening (BIOGEA) researches the impact of land use change on Green and Blue Infrastructure (GBI) in the agricultural landscape.

Agricultural GBI will be examined through policy analysis on the EU, national level and local level and through biological monitoring and modelling in six case study areas in 3 Member States. The case studies in Germany, Spain and Bulgaria pair twinned relatively extensive and intensive landscapes and have been chosen to represent a range of different biogeographic regions and political settings.

Project outputs will include advisory tools for the case study areas and policy recommendations for the CAP reform for the case study countries and the EU-level. Existing biological indicators will be tested and developed to measure impacts of changes on GBI. The outputs of the project will be developed and tested together with a range of stakeholders. Figure 1 shows the BIOGEA work packages and the main planned outcomes.

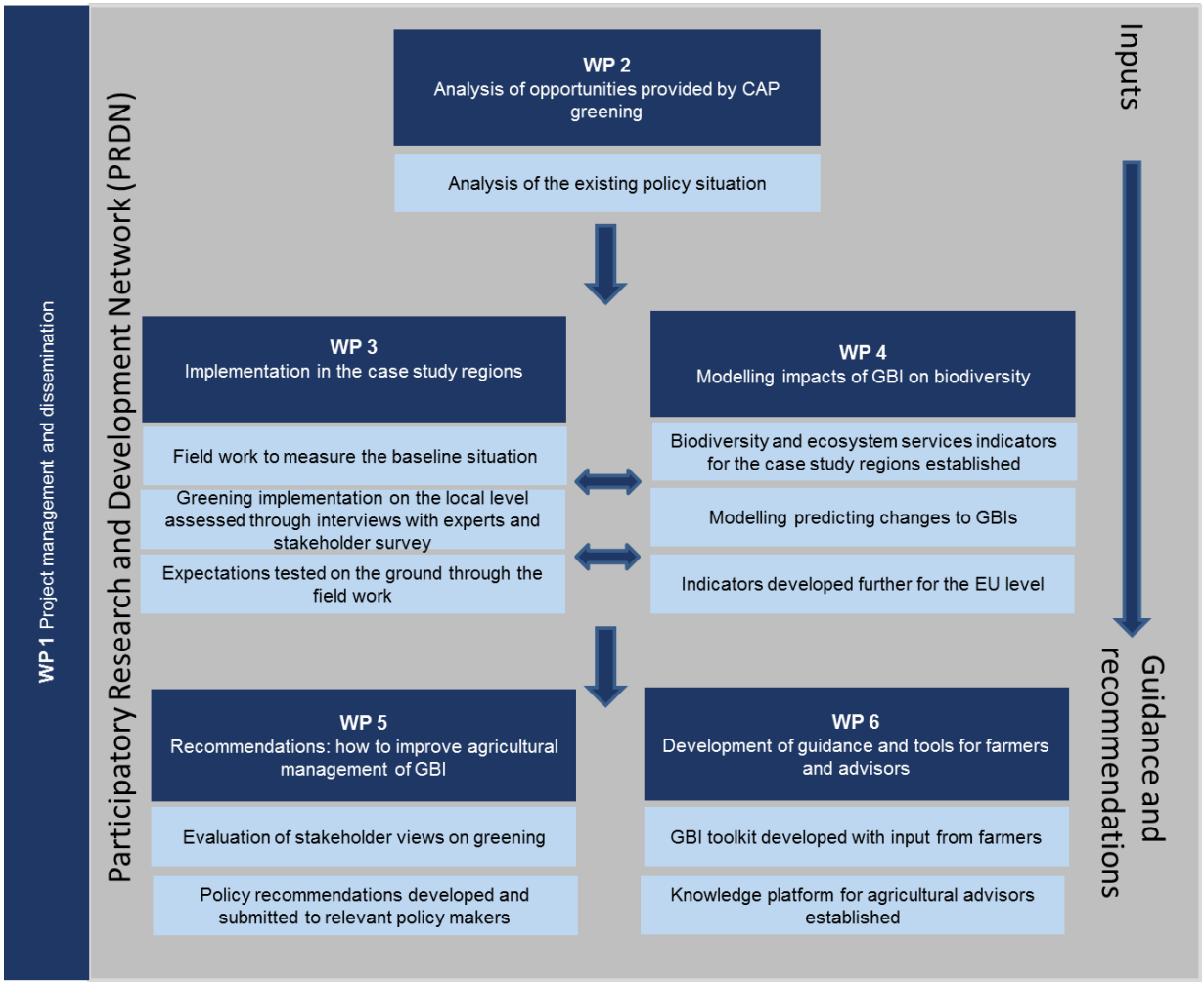


Figure 1. BIOGEA work packages and their main outputs

BIOGEA will make sure its outcomes are policy-relevant by 1) ensuring that the research is well-placed within the current land use policy framework; 2) that the terminology used agrees with that included in the relevant EU and national policies; and 3) that outcomes are communicated in a timely manner so as to fit with the policy reform and evaluation timeframe, especially taking into account the timetable for CAP reform.

WP 2 is therefore a central work package for informing the research carried out through the rest of the project. It is informed by the stakeholder analysis carried out in WP 1. It feeds directly into the analysis of national policies and the case study analysis, particularly Task 3.2 (policy implementation on the local level). The link with WP 5 (policy recommendations) is also of central importance as views on how policy can be changed will already be gathered in the stakeholder engagement planned in WP 2 and 3.

WP 2 aims to contribute to answering the project research question:

- Is policy on the EU to local level designed and implemented to provide GBI?

It is relevant to all the project hypothesis but particularly for the testing of the impact of CAP greening in varying local conditions (comparing the policy aims with the policy implementation).

1.2 The BIOGEA Assessment Framework

The BIOGEA Assessment Framework is described in deliverable D2a. An adapted version of the ES cascade model (Haines-Young, Potschin 2010) has been adopted as the conceptual framework under which the BIOGEA hypotheses will be tested (Figure 2). The cascade model shows how biodiversity and ecosystems provide benefits to humans through the flow of ecosystem. These are sourced from the individual features (habitats and species), progress through their ecosystem functions (how they impact on the surrounding ecosystem or wider environment), to the "aims" assigned to these functions by policy (the provision of ES and the related benefits to humans). In turn, the way people value GBI, will influence their approach to addressing the pressures on GBI.

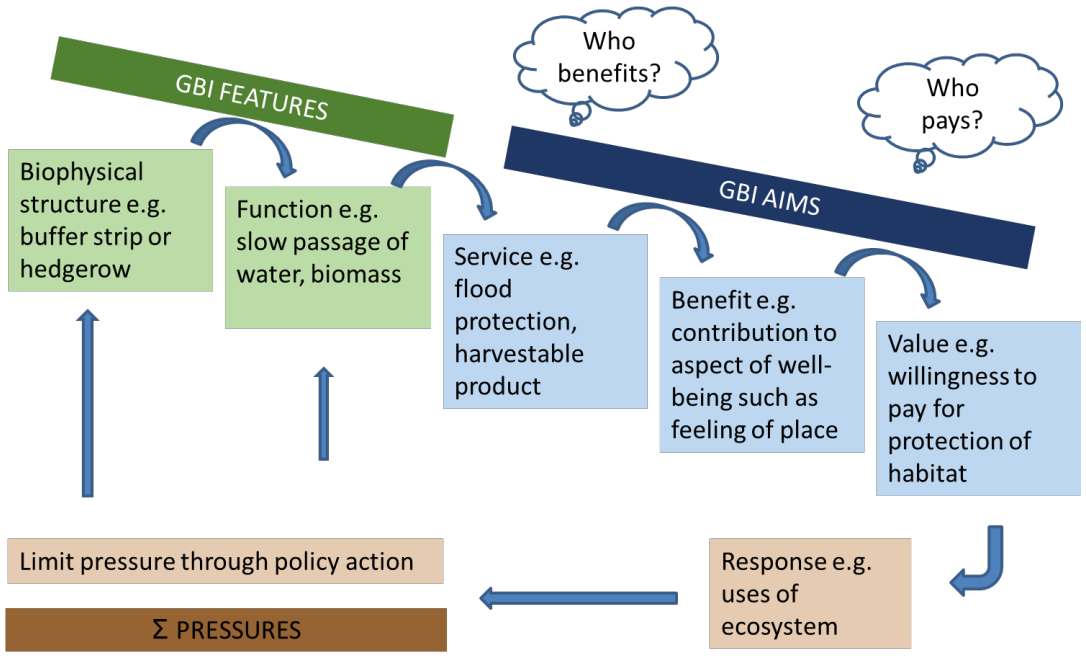


Figure 2. The cascade of ecosystem services from "GBI features" which result in the fulfilling of "GBI aims". Adapted after: (Haines-Young, Potschin 2010)

The analytical approach is defined by the division of GBI into two tiers:

1. physical “GBI **features**” such as pasture, hedgerows, ponds, bogs, etc. which provide habitat and allow movement of species between different habitats;
2. a means of providing ES to reach particular “**aims**” included in environmental policy such as water quality management, climate adaptation or wildlife protection. The strategic planning element of GBI is included in the concept of GBI aims.

In the project context, only GBI in rural, largely agricultural, settings is considered (marine, urban and purely forested areas are excluded).

The EU policy overview carried out in WP 2 defines the EU level GBI aims and provide a methodology for examining the national and local-level GBI aims. It will also identifies GBI features addressed in policies at the EU level and provides an agreed “policy-relevent” list of features to measure during the field work (WP 3).

1.3 Scope of the deliverable

In this deliverable we present:

The EU Policy Overview – identifying the GBI aims

- The selection of the EU policies of greatest relevance to GBI, which provide a basis for examining relevant policies on the national level;
- A framework to analyse the selected policies for their relevance to GBI (their reliance on and influence on GBI);
- The identified “GBI aims” of the EU instruments analysed i.e. the environmental targets which are most relevant to GBI based on the policy documentation followed up stakeholder interviews;
- A policy timeframe giving an overview of the plans for evaluation and reform for the following years and thus the opportunities to make changes to the different policy areas and potentially improve their coherence with one another.

Identifying the GBI features included in policy

- A list of features to be included in the project based on their inclusion in the GBI relevant policies.
- A framework to link the GBI features included in the project and the GBI aims.

Refining the findings to identify critical aspects for the different governance levels

- A framework for developing the country files and case study profiles to examine the implementation of policy nationally and the impact on the most relevant features locally.

Conclusions and next steps

- The most relevant findings from the policy overview and identification of critical aspects for the rest of the project.

2 EU Policy overview – identifying the GBI aims

2.1 Background

2.1.1 Policy making

Policy can be described as the conscious choices made by government to maintain social order, address the needs of citizens and solve specific problems (Dye 1972). The policy cycle (Figure 3) is used to describe the flow from the initial problem through the formation and implementation of policy to its final evaluation to see if it has reached its aims (Howlett 2010).

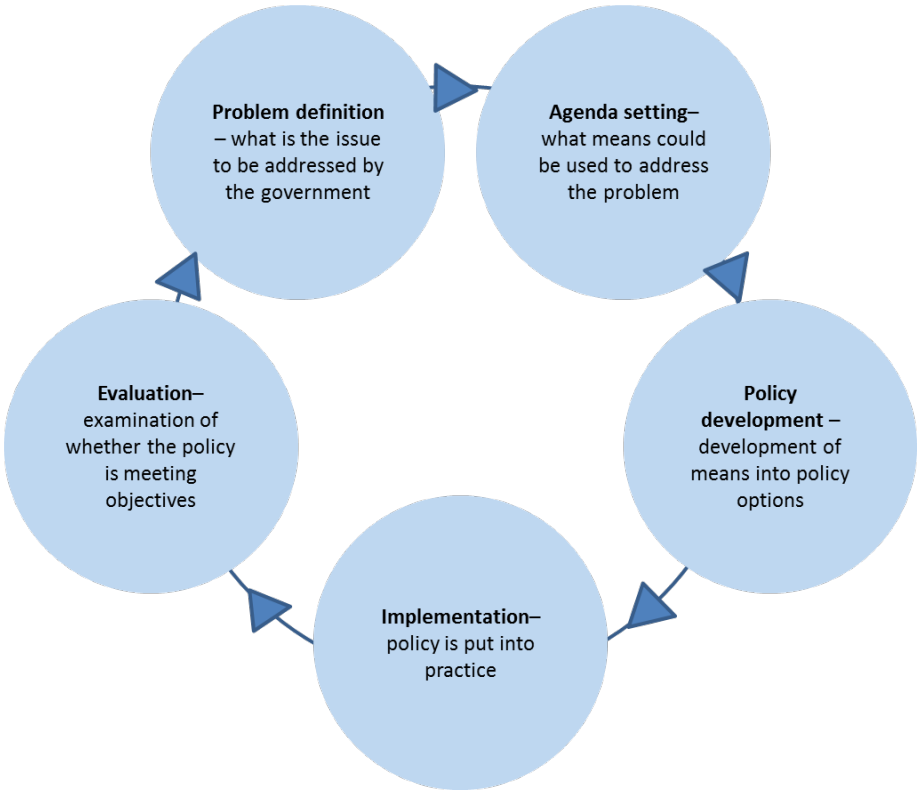


Figure 3. Policy cycle

Policies cover all aspects of government business and policy formation may be carried out in ministry or civil service departments involving a variety of decision-making processes. Ensuring policy aims are coherent, is therefore also an important part of the policy-making and evaluation process and needs to be considered at different stages of the policy-cycle. Policy coherence is important to ensure efficient use of resources: if policies are coherent, their combined effects will accomplish more than the single policy on its own. However, if they conflict, their goals or implementation practices work against one another. Synergies and conflicts can be recognised at three levels: policy objectives, policy instruments and implementation practices including outcomes and impacts (Nilsson et al. 2012).

For this reason, assessment of policy coherence is increasingly built into EU policy making. The better regulation agenda including the Regulatory Fitness and Performance (REFIT) programme (European Commission 2016b) and the Environmental Implementation Review (European Commission 2017g) aim to improve the implementation of EU (environmental) policy. Under REFIT, “fitness checks” are carried out examining five aspects of policy: effectiveness (Have the objectives been met?); efficiency (Were the costs involved reasonable?); coherence (Does the

policy complement other actions or are there contradictions?); relevance (Is EU action still necessary?) and EU added value (Can or could similar changes have been achieved at national/regional level, or did EU action provide clear added value?).

Coherence is particularly important for many environmental policy areas as often they do not have their own funding streams but are instead funded through "mainstreaming" into other policy areas. "Mainstreaming" of EU environmental policy has been trialled in particular for climate change and biodiversity policy with mixed success (Pollack, Hafner-Burton 2010). Since these environmental fields are affected by a wide range of economic activities, mainstreaming is indeed necessary. The risk with such an approach, however, as has been seen with biodiversity policy, is that while the terminology of ecosystem services may make its way into a wide range of policy documents, without ring-fencing of funds or monitoring of activities, real outcomes for biodiversity may remain out of reach (Milieu et al. 2016).

To examine coherence of policies it is necessary to look at how they interact with one another given existing external drivers, both internally (within the policy) and externally (between policy areas) and considering different implementation levels. Four types of interaction are therefore examined in BIOGEA (Table 1).

Table 1. Policy interactions examined in BIOGEA (Munaretto, Witmer 2017)

Policy area	**Governance level**	
	Horizontal	Vertical
Internal	Looks at interaction of objectives, instruments and implementation within a policy area e.g. national implementation of pillar 1 and pillar 2 of the CAP.	Looks at interaction within a policy area across governance levels e.g. national agricultural policy goals vs. EU agricultural policy goals.
External	Looks at interaction across multiple policy areas at the same governance level e.g. national agricultural policy goals vs. national biodiversity goals.	Looks at interaction between policy areas across governance levels e.g. national biodiversity policy goals vs. EU agricultural policy goals.

Clearly multiple interactions between and within policies on different governance levels exist. In most studies, to simplify the process of assessing policy coherence, pairs of policies are compared. In the case of BIOGEA, the coherence of a range of environmental policies (GBI reliant policies) are compared with policies impacting on GBI (GBI influencing policies) (see definitions below). The interactions between "influencing" and "reliant" policies are described in a qualitative manner.

The internal coherence of GBI "reliant" policies is assessed to a lesser extent although their most important goals relating to GBI are examined. This implies the assumption that the aims of the GBI reliant policies (biodiversity, water and climate policy) are coherent with one another. An initial review of the literature suggests that this is not always be the case, particularly on the level of implementation practices, however in general, their goals, relating to GBI in the wider landscape are judged as being coherent (Nilsson et al. 2012).

A further challenge when examining policy coherence, is that there is a time lag between the adoption of policy and its implementation. In BIOGEA, the current implementation of policies are examined but taking into consideration upcoming changes. Such a practical approach is important to inform the policy recommendations which will be targeted at upcoming policy reforms.

2.1.2 Objective of the EU policy overview

The objective of the policy overview is to:

1. Identify "GBI relevant policies" by examining the extent to which GBI is implicitly or explicitly included in relevant EU policies and to make a first estimation of whether this inclusion is likely to be meaningful;
2. Examine the coherence between the aims of the "GBI reliant policies" and the likely impacts of the "GBI influencing policies";
3. Provide a framework for assessing policy translation on the national level and implementation in the case study areas.

The focus is therefore not only on the terminology used, but also on the likely impacts of activities incentivised by a policy on land use and the GBI features included in the project. The examination of the most "GBI-relevant" policies are used to define the EU-level GBI aims (the political targets, strategic goals and aims) which will then be examined further and refined on the national and case study levels.

2.1.3 Definitions

Green and Blue Infrastructure (GBI)
GBI is not a well-defined concept within policy. It can mean different things to different actors and has been used to mean anything from green energy measures in an urban setting to extensive agriculture (Wright 2011). The European Commission's Green Infrastructure Strategy (European Commission 2013a) defines Green infrastructure as:

> *"a **strategically planned network** of **natural and semi-natural areas** with other environmental features designed and managed to deliver a **wide range of ES**. It incorporates green spaces (or blue if aquatic ecosystems are concerned) and other physical features in terrestrial (including coastal) and marine areas. On land, GI is present in rural and urban settings." (European Commission 2013a)*

For the European Commission, therefore, three elements are essential for the definition of green or blue spaces as GBI:

- Strategic planning;
- Natural and semi-natural features;
- Delivery of ecosystem services.

The GI Strategy was established to help to meet Target 2 of the EU Biodiversity Strategy, which describes the overarching aims of the EU to halt biodiversity loss by 2020 through a range of policy mechanisms.

> *Target 2: By 2020, ecosystems and their services are maintained and enhanced by establishing **green infrastructure** and restoring at least 15 % of degraded ecosystems.*

The GI Strategy describes how GBI should be used as a tool to implement policy and should also be considered as an investment priority for EU funds. The strategy does not put in place its own funding mechanism or policy instrument for GBI but instead describes how it can be mainstreamed into existing policies and the additional measures which could be considered in these policies in order to better support GBI.

Within BIOGEA, a two-tiered approach to defining GBI is adopted. GBI is:

1. physical "**features**" such as pasture, hedgerows, ponds, bogs, etc. which provide habitat and allow movement of species between different habitats;

2. a means of providing ES to reach particular "**aims**" included in environmental policy such as water quality management, climate adaptation or wildlife protection. The strategic planning element of GBI is included in the concept of GBI aims.

In the project context, only GBI in rural, largely agricultural settings is considered (marine, urban and purely forested areas are excluded). Agriculture has been a main driver for the loss of biodiversity through intensification of existing farmland and conversion of natural land into cropland during the last century. Agricultural activities have a significant influence on the potential of meeting the EU's aims for establishing GBI and meeting biodiversity targets as well as water, soil and climate change and adaptation targets. Recent policy reviews found that agricultural practices are the most significant barriers to environmental targets being met (European Commission 2015a), (Milieu et al. 2016), (European Commission 2015b).

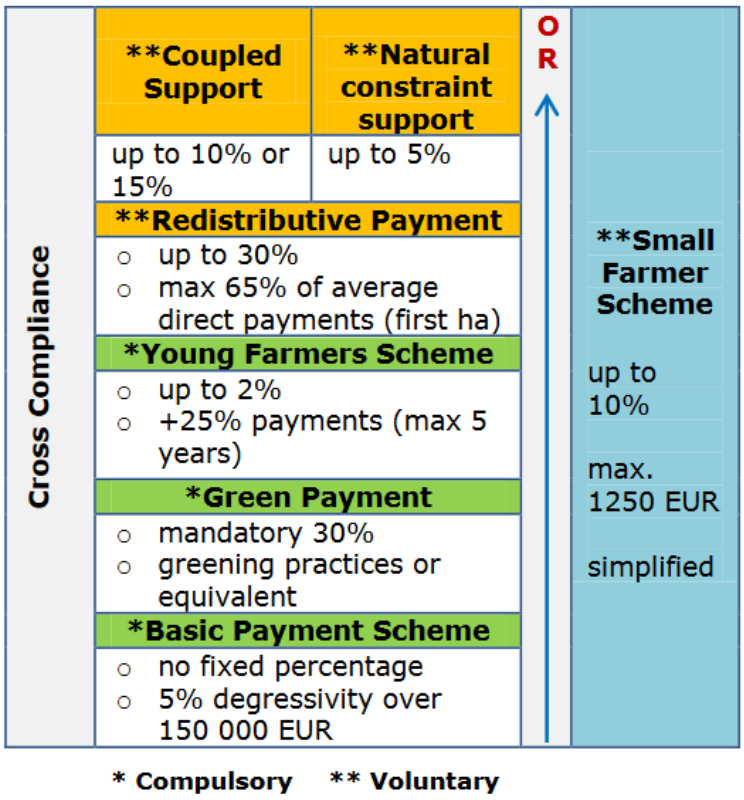
Policy Instruments
Policy instruments are considered to include a range of policies and regulatory instruments such as directives, communications and strategies. These vary not only in scope but also in their mode of steering (i.e. a range of mechanisms from command and control with full monitoring systems and penalties attached for non-compliance; funding schemes based on monetary incentives; to strategies and action-plans with a more advisory or coordinator role).

There can be significant differences between these categories but also within a particular category. For example, the EU Biodiversity Strategy is based on a legally binding international agreement and backed up by legislation in the form of the Birds and Habitats Directives. The Soil Thematic Strategy, on the other hand, was regarded as a step on the way to introducing legislation, however this legislation has never been put in place. These instruments therefore vary in their binding character and the obligations attached. Additionally, there are variations in where the responsibilities fall between the EU, national and regional levels i.e. the policy effects in terms of multi-level governance and subsidiarity as well as the extent to which stakeholders are involved in decision-making on policy developments. These policy characteristics are examined in more detail in this deliverable.

GBI relevant policy
GBI relevant policy within BIOGEA is characterised as policies with a high **influence** on GBI (agricultural policy) and policies which **rely** on GBI to reach their aims (environmental policies).

The main **GBI influencing policy** on agricultural land is the Common Agricultural Policy (CAP) which still makes up nearly 40% of the EU budget. The CAP, which was initially established to improve food security and increase agricultural productivity, has evolved over time. Reducing the environmental impacts of the CAP has been an important part of the CAP reform discourse since the 1990s when pillar 2, which is specifically targeted at wider rural development rather than agricultural production, was introduced. The agri-environment payments under pillar 2 were for a long time, the most important contribution to environmental aims. Their voluntary nature, however, meant that in most Member States, uptake by farmers was limited, so that their contribution to the aims of providing environmental benefits to the wider countryside could not outweigh the impacts of intensive production on GBI (e.g. Díaz, Concepción 2016).

The latest reform introduced a number of changes to the CAP. Under the new system, pillar 1, direct payments are made up of a basic payment (or single area payment) determined by the area of land farmed plus a number of optional and compulsory additional schemes. Included in the optional schemes are a small farmer scheme (SFS), voluntary coupled support (VCS) to support production in particular sectors and additional support to the Areas of Natural Constraints (ANC). Compulsory schemes include support to young farmers (up to 40) and a "greening" payment (see Figure 4 for an overview of the different schemes).



Source: DG Agriculture and Rural Development.

Figure 4. Support payments under Pillar 1 of the CAP (direct support).

The greening payment is that of most obvious relevance to GBI. 30% of all direct payments should be dedicated to "greening"; that is broad and shallow agri-environment measures to be applied across the whole of the EU. This should create a strong incentive to include measures benefitting increased GBI in the farmed landscape. Greening includes the following components:

- Crop diversification – farmers with between 10-30 ha of arable land must grow two arable crops. Farmers with more than 30ha must grow three arable crops.
- Permanent pasture – environmentally sensitive permanent pastures (designated by the Member States) must not be ploughed. Farmers must not convert more than 5% of total permanent pasture (land that has been pasture for over 5 years) to arable.
- Environmental Focus Areas (EFA) – farmers with more than 15ha of arable land must dedicate at least 5% to EFAs. The following count as EFAs: field margins, hedges, woodland, fallow land, landscape features, buffer strips, nitrogen fixing crops and ponds.

Member States can also adopt national certification schemes which are equivalent to these practices. There are a number of exemptions from greening including organic farmers and those taking part in the small farmer scheme.

The **GBI reliant policies** are those policies for which having GBI in the agricultural landscape is important to reach their aims. As a starting point for identifying these policies for BIOGEA, the EU GI strategy was used to identify a long list of policies to be examined in this deliverable. The policy areas which are found to be most relevant are in the areas of biodiversity, water and climate. Figure 3 shows the different policies which rely on GBI to reach their aims and how they are interlinked.

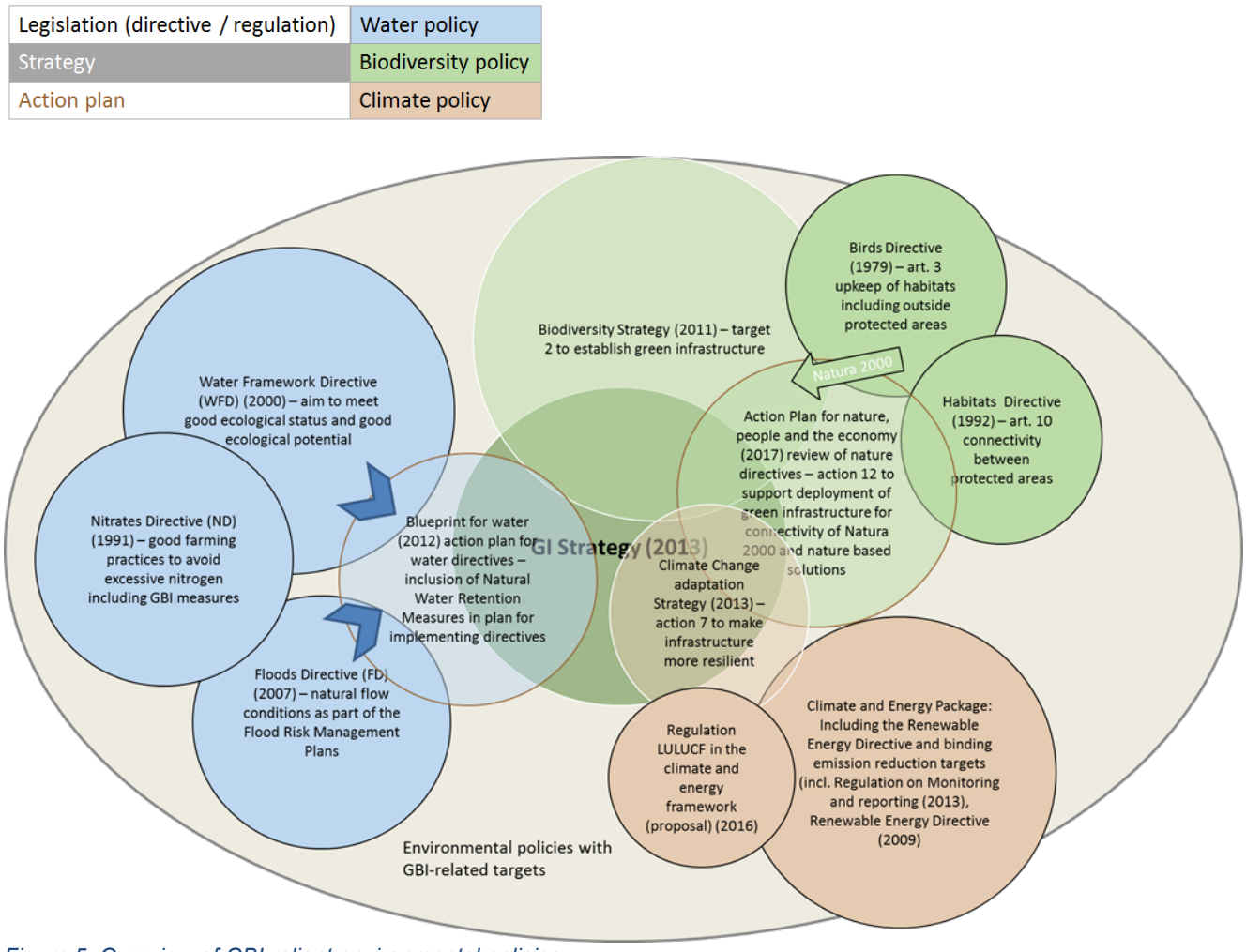


Figure 5. Overview of GBI-reliant environmental policies.

2.2 Methodology for the EU policy analysis

2.2.1 Identifying the relevant policies

BIOGEA examines GBI in agricultural land. The two policies of highest relevance are therefore the GI Strategy and the CAP. These have very different characteristics (see policy instruments above). The GI Strategy has no attached funding but a range of ambitious aims for integrating GI into a wide range of other policy instruments. The CAP is a financial instrument which makes up the largest proportion of EU funding. While it also has ambitious environmental goals, the targeting of support to reach environmental aims has been subject to criticism.

In addition to these two framing policies, the following long list of policies were identified as having potential to integrate with the concept of GI (European Commission 2013a; Schleyer et al. 2015).

- EU Biodiversity Strategy 2020
- Birds Directive
- Habitats Directive

- Europe 2020 Strategy, contributing to the regional policy
- EU Strategy on adaption to climate change
- Environment Action Programme to 2020
- Environment and Health Action Plan (for health benefits in urban areas particularly)
- Regional and Cohesion policy
- European Spatial Development Perspective
- EU 2020 Territorial Agenda
- Urban Strategy
- EU Forest Strategy
- EU Energy Policy
- TEN-T and TEN
- Green Belt Initiative
- Water Framework Directive/ river basin management plans
- Floods Directive
- EU Drought Policy
- EU Water Blueprint
- Thematic Strategy for Soil Protection
- Environmental Impact Assessment and Strategic Environmental Assessment Directives
- Environmental Liability Directive
- Marine Strategy Framework Directive
- EU Marine Spatial Planning Strategy
- 2002 Recommendation of Integrated Coastal Zone Management (ICZM)
- Fisheries Policy (marine)
- Disaster Risk Reduction Policy

2.2.2 Exclusion of policies outside the scope of the project

As a first step of the policy overview, the long-list of policies was refined and certain policies excluded. Since BIOGEA focuses on agricultural GBI, policies influencing only the urban or marine environment were excluded. In addition, subjects where there is no EU-level policy referring to the EU members states, were excluded (e.g. Disaster Risk Reduction refers mainly to developing countries) or where the policy coverage is much broader than land use (e.g. the Europe 2020 Strategy). International agreements on which EU policies are built (e.g. the CBD) were only analysed in so far as they impact on the compulsory or binding nature of the EU policy. Updates of policies were combined with the initial policy where possible e.g. the Water Blueprint was analysed together with the WFD and Floods Directive and the Action plan for nature, people and the economy with the Birds and Habitats Directives. This resulted in definition of a shorter list of policies potentially impacting on GBI.

2.2.3 Characterisation of the policies

In a second refinement step, the policies were characterised. The characterisation ranked GBI-relevant policies in terms of their:

1. Influence on GBI

This was considered to mean policies with a significant influence on rural land use which might positively or negative impact on the quality and quantity of GBI.

2. Reliance on GBI

This meant policies with a significant reliance on GBI for meeting their aims e.g. the Biodiversity Strategy is reliant on provision of GBI to meet its aim to better implement Natura 2000 and link protected sites.

In reality, many policies both influence and rely on GBI; for example, the CAP influences GBI through encouraging particular farming practices but also relies on GBI to meet its environmental aims; biodiversity policy relies on GBI to provide habitats and ecosystem services and also aims to increase the amount of GBI. Nonetheless, the incentives attached to the policies allow them to be categorised as having greater influence or reliance: the CAP's environmental aims are based on existing environmental policy and environmental policies relies to a large extent on the funding provided through the CAP to reach their aims on agricultural land.

2.2.4 Policy assessment

The framework presented below was used to collect the relevant information on each policy. The initial literature review identified several overviews of EU environmental policies relevant to the BIOGEA project objectives, in particular, two recent reviews which examined the concept of ES within the Openness project (Schleyer et al. 2015) and Ecosystem Based Management within the Aquacross project (Rouillard et al. 2016). The individual assessments of the relevant policy instruments produced for these projects were used and built upon using the original policy documentation. Two aspects were examined:

1. The policy characteristics;

2. The policy aims related to GBI.

2.2.5 Policy characteristics

The purpose of assessing the policy characteristics was to provide an overview of the likely influence of the policy on GBI over the timeframe covered by the project. Table 2 describes the aspects examined.

Table 2. Policy characteristics

Heading	Explanation
Type	Regulation, directive, strategy, action plan, framework, instrument mix
Mode of steering	How the policy is managed e.g. through command and control, financial incentive, advisory, mix
DG responsible	EC responsibility
Implementation responsibility	Description of where responsibility lies between EU (which institutions), national, regional
Reporting requirements	What MS need to report to the EU, EU reporting
Financing	Direct funds attached, aims for mainstreaming within EU funds, national funding requirements.
Stakeholder / expert engagement	Engagement of stakeholders and experts in the EU policy-making process
Policy timetable	Overview of next steps expected, reforms, evaluations, etc.

The overview for each policy was used to rank the likely impact of the policy on GBI using a scale from 0-5 following a typology (Table 3) adapted from (Schleyer et al. 2015) (originally adapted from Helming et al. 2013).

Table 3. Typology for ranking policy impact on GBI

Description	Type
No influence	0
Potential to have some impact on land use but not a main focus	1
Aims to influence land use but not reflected in measures, financing or monitoring	2
Aims to influence land use / GI and has some financial resources attached	3
Policy likely to impact land use, has resources attached and reporting requirements.	4
Policy likely to have significant impact on rural land use and this reflected in financial resources, reporting and monitoring	5

2.2.6 Policy aims

The information collected under the headings listed in Table 4 was used to examine the coherence of the policy objectives with the concept of GBI.

Table 4. Coherence of policy objectives with the GBI concept

Heading	Explanation
Main goal	The overall goal of the policy (not just related to GBI)
Operational objectives related to GBI	The aims most relevant to GBI
Specific mention of GBI	Is the terminology Green Infrastructure or Natural Water Retention Measures used?
GBI structures (features or connectivity)	Is there specific mention of the GBI features or of habitat connectivity?
Multifunctionality (explicit mention of delivering benefits for people and the environment)	Is the terminology multifunctionality, nature based solutions, ecosystem based management or similar used?

The overview was used to rank the reliance of the policy on GBI for meeting its aims using a scale from 0-5 following a typology (Table 5) adapted from (Schleyer et al. 2015) (originally adapted from (Helming et al. 2013)).

Table 5. Typology for ranking reliance of policy on GBI for delivering aims (coherence of aims with the concept of GBI).

Description	Type
No ecological or environmental issues mentioned or referred to in policy aim	0
Environment mentioned but not a prominent objective	1
Environment one of a number of policy aims	2
Significant environmental framing but ES or specific habitats connectivity not explicitly mentioned in aims	3
Framing around ES and / or connectivity of habitats / specific mention of GI	4
Policies main aims to maintain ES / connectivity of habitats / promote GI	5

Each of the identified policies was given a separate ranking for their influence on and reliance on GBI. Those policies with a score of 4 or over in either category or a combined score of 6 or over were included in the next steps of the assessment (interviews and the overview of ES provided by the GBI features in Chapter 3).

2.2.7 Engaging the PRDN: meetings with stakeholders

To supplement the information gathered through the literature review, meetings were held with European Commission officials and representative stakeholder organisations (see Annex 1 for list of interviews). A semi-structured question process was followed (see Table 6). The meetings were carried out concurrently with the initial literature review (spring 2017) and were regarded as a means to complement the information gathered in the literature, confirm or refute understanding of how policies are implemented in practice and provide additional information on the policy timeframes, important stakeholder groups involved and the process of policy making and delivery. The meeting structure was fairly flexible depending on the time constraints and interests of the participants.

Table 6. List of topics covered in the initial meetings with stakeholders and decision-makers.

Section	Prompts
Introductions	• Meeting participants • BIOGEA, aims, countries involved, funding.
Objective of meeting	• Reason for series of meetings in the early stages of the project: • Importance of fit with the policy timetable; • Planned engagement over the course of the project the PRDN; • Two-way engagement, potential to feed in information into the project and also make suggestions for design and useful outputs.
Current policy framework	*These questions were varied to focus on the area of experience of the interviewee*
Understanding of GBI	• How would interviewee define GBI? • What is their understanding of coherence of the concept with other policy areas?
Policy process in specialist area	• Questions on the planned work in the specialist policy area • Reviews, evaluations, etc. • Engagement of stakeholders
CAP Greening – likely impact	• Views on each measure – crop diversification, permanent pasture, EFA • Viewpoints on what they have achieved – how much implemented in practice? • Likely impact on specialist area?
Incentives from CAP more broadly (for those working on CAP)	• Other aspects of Pillar 1 (cross compliance, definition of agricultural land, active farmer, coupled support). • Pillar 2 – Rural Development (AEC, N2000 / WFD, ANC)
Changes planned before next reform	• Questions regarding the changes planned to the EFA % etc • Current consultation process
Future options	
CAP	• Consultation process • Involvement of different actors • Realistic options for change • Timing of decision process
Policy integration	• Options for inclusion of GBI • Impacts on area of main interest to interviewee

Helpful for you?	
What do you need to know?	• What information lacking from existing studies • National and case study level work • Field work
Views on approach taken to engaging stakeholders	• Focus of interviews and workshop and potential timing • Groups to engage • Existing processes to be aware of
Further information	
Other contacts and research	• Contacts: stakeholders, researchers, EC contacts • Studies / references, projects

The main purpose of the meetings were to discuss the GBI relevant policies identified, their coherence with one another, involvement of stakeholders in the policy process and in particular, the timetable for policy reform or evaluation.

The meetings were regarded as initial contact through the project with relevant stakeholders (a first step in a longer relationship through the PRDN) rather than one-off information gathering. Follow-up information is therefore sought with interviewees (e-mail and telephone) over the course of the policy analysis and they are kept up to date with the project actions (e.g. through being sent policy briefings).

2.2.8 Engaging the PRDN: focus groups

In a second step of testing the findings, focus groups were organised with groups of stakeholders. On the EU level, two main groups were targeted. These were environmental NGOs and farming representatives.

The first focus group was carried out with the European Environmental Bureau Agricultural Working Group (18 October 2017). Two members of the BIOGEA project team attended the meeting and managed an hour's discussion focusing on the impact of CAP greening on GBI. The group was divided into two smaller groups who examined the two themes separately.

The second focus group was carried out with COPA-COGECA Working Party on the environment (21 November 2017). Three members of the BIOGEA project team attended and presented the project and led an open discussion for 45 minutes. Following the experience of the first focus group, the group was in this case not divided and the discussion was led from the front (see Annex 2 for the minutes of both meetings).

The discussions concentrated on the two themes below though the sub-questions were slightly different for the two groups. In practice, the EEB focus group concentrated more on the different parts of CAP greening while the COPA-COGECA participants were more interested in discussing how a Green Infrastructure strategy might be implemented nationally.

Theme 1. National implementation choices related to greening and GBI

a. How do the Member State choices impact on greening?
b. What measures are most important for greening?
c. Does a national Green Infrastructure strategy exist and does it include agriculture?

Theme 2 Implementation of greening measures on the ground

a. What are the most important influencers for farmers' choices regarding greening and have these changed over time?
b. How can advisory services contribute to providing GBI and connecting elements?
c. How can farmers work together on greening?

The focus groups were carried out at a later stage of the project than the interviews (autumn 2017). The purpose was therefore to collect feedback on the findings of the policy analysis so far and particularly, to gather input on the next steps, particularly the national level policy evaluations and case study interviews. The focus groups helped to highlight where stakeholders saw strengths and weaknesses of implementation of GBI-relevant policies in their own Member States and aspects which the project could examine further. A final aim of the interaction was to raise awareness about the project and identify contacts for future work.

2.3 Results of the policy overview – the GBI aims

2.3.1 Ranking of influence and reliance on GBI

Table 7 shows the list of policies included, their main objectives and the assessment of their influence and reliance on GBI based on the characteristics and objectives.

Table 7. List of EU policy instruments (legislation, strategies and action plans) which rely on or influence GBI. Those policies marked in green are those selected for further investigation.

Subject area	Political instrument	Objective	Influence	Rely
Biodiversity	Biodiversity Strategy	By 2020, biodiversity loss and the degradation of ecosystem services is halted, and restored as far as possible.	3	5
	GI Strategy	Promote the development of GI by creating an enabling framework for nature-based solutions.	2	5
	Invasive Alien Species Regulation	Seeks to address the problem of invasive alien species in a comprehensive manner so as to protect native biodiversity and ecosystem services and impact on humans	2	1
	Birds Directive	Protect all wild bird species naturally occurring in the EU.	3	4
	Habitats Directive	Conserve rare, threatened or endemic animal and plant species naturally occurring in the EU.	3	5

Climate and energy	Climate and energy package for 2020	Sets targets for GHG emissions, renewables and efficiency to 2020.	2	3
	Climate and energy framework for 2030*	Sets targets for GHG emissions, renewables and efficiency 2021-2030. LULUCF included.	3	3
	Renewable Energy Directive	EU to fulfil at least 20% of its total energy needs with renewables by 2020.	3	0
	Climate Change Adaptation Strategy	To make Europe more climate-resilient and enhance the preparedness and capacity to respond to the impacts of climate change.	1	4
Water	Water Framework Directive (WFD)	To achieve good status for all waters in Europe by preventing further deterioration, promoting sustainable water use, enhanced protection and improvement of aquatic systems, reduction of pollution, mitigating the effects of floods and droughts.	3	3
	Floods Directive	To reduce and manage the risks that floods pose to human health, the environment, cultural heritage and economic activity.	3	3
	Nitrates Directive	Protect water quality by preventing nitrates from agricultural sources from polluting ground and surface waters and by promoting good farming practices.	3	3
Land use	CAP pillar 1	Enhance the competitiveness and sustainability of the EU agricultural sector.	5	2
	CAP pillar 2	Help rural areas meet economic, environmental and social challenges.	5	3
	Forestry Strategy	Ensure and demonstrate sustainable forest management providing the basis for a competitive bio-based economy.	1	3
	Soil Thematic Strategy	Protect soil, while using it sustainably, through prevention of further degradation, preservation of soil function and restoration of degraded soils.	0	3
Grey Infrastructure	Trans-European Network (transport)	Aims to close the gaps between Member States' transport networks, remove bottlenecks that still hamper the smooth functioning of the internal market and overcome technical barriers.	3	0

** The climate and energy framework (2030) will potentially be of high relevance to GBI, however its predecessor, the climate and energy package (2020) is not. This is because of the inclusion of Land Use, Land Use Change and Forestry in greenhouse gas emissions accounting for the framework. Since the framework is however, not yet in place, it has been excluded from some of the tables below.*

In the next sections, the characteristics and aims of those policies identified as GBI relevant are described in more detail.

2.3.2 Policy characteristics

It is not only a policy's goals which are important for its relevance to GBI but also its means – the techniques, mechanisms and tools which are used to attain the goals. Here we break down the means further to provide a qualitative examination of a number of aspects which can be regarded as indicative of how effective a policy is likely to be. Examining each of these aspects individually, however could easily give a false picture. A policy may have a strong legislative framework but lack monitoring and enforcement to back it up. Equally a policy may be purely advisory in its mode of steering but may be backed up with successful stakeholder engagement and information campaigns which result in the desired change of behaviour.

2.3.2.1 Type and mode of steering

Table 8. GBI relevant policy types and modes of steering

Policy	Policy type	Mode of steering
Biodiversity strategy	Strategy	Mixed: brings together a range of instruments focusing on biodiversity including an international binding convention (CBD) and the nature directives.
GI Strategy	Strategy	Advisory: aims to bring together a range of initiatives – does not have a strong legislative backing in its own right.
Nature Directives (Birds and Habitats)	Directives	Command and control: sets in place the framework including list of species in the annexes and the requirements for site selection. MS must meet. MS can choose which instruments to use to meet the requirements.
Climate Change Adaptation Strategy	Strategy	Advisory: bringing together existing initiatives. Has reporting requirements.
Water Framework Directive	Directive	Command and control: sets in place the framework for Member State activities. MS have flexibility in implementing them.
Floods Directive	Directive	Command and control: sets in place framework but with flexibility given to MS in implementation.
Nitrates Directive	Directive	Command and control sets in place framework and requirements but with flexibility given to MS in implementation.
CAP Pillar 1	Fund	Policy framework made up of a range of regulations and financial incentives.
CAP Pillar 2	Fund	Policy framework made up of a range of regulations and financial incentives.

2.3.2.2 Responsibilities and reporting

The GBI relevant policies identified through the EU-level analysis are all EU policies and the European Commission is therefore responsible for the initial policy proposals and in many cases, the framework for implementation. Table 9 shows the overall responsibility for the policy within the Commission, the monitoring reporting and monitoring requirements attached to the policies and who is responsible for carrying them out. The reporting requirements give an indication of the level of control from the EU level. Where reporting is significant and backed up with potential legal

action in the case of non-compliance, the EU can clearly require more from Member States than in cases where they have no information.

Table 9. Responsibilities, reporting and monitoring requirements

Policy	DG	Reporting and monitoring requirements	What is monitored
Biodiversity strategy	ENV	EC: mid-term strategy and final assessment showing progress against the targets (full implementation of nature directives; maintain and restore ecosystems and their services; increase contribution of agriculture and forestry; ensure sustainable fisheries; combat invasive alien species; help avert global biodiversity loss MS: as signatories to the CBD, MS are required to report on their progress on meeting the CBD targets (next report December 2018)	Streamlining European Biodiversity Indicators (SEBI) indicators identified as relevant to meeting the targets
GI Strategy	ENV	EC: gathering information on GI initiatives; GI guidance for MS is being developed as part of the Action Plan for Nature, People and the Economy MS: no formal reporting requirements – EC collects information informally e.g. through the GI working group.	GI initiatives, (MS strategies and plans)
Nature Directives (Birds and Habitats)	ENV	EC: compilation report from the MS reporting every 6 years. MS: Progress in implementation reports required every 6 years. Reports on derogations every 2 years.	Birds, other protected species, protected habitats in and outside Natura 2000 sites.
Climate and Energy	CLIMA	MS and EC as parties to the UNFCCC must report on their emissions annually "greenhouse gas inventories". Biennial reporting is also in place on policies, measures and progress. MS: report through the greenhouse gas monitoring mechanism.	Annual emissions of 7 GHG from all sectors including LULUCF and agriculture. Policies, measures and progress.
Climate Change Adaptation Strategy	CLIMA	EC: reports to the European Council and Parliament on the state of implementation (2017). MS: report to the Commission through the Monitoring Mechanism Regulation on national adaptation planning and strategies.	Measures taken to adapt to climate change.

Policy	DG	Reporting and monitoring requirements	What is monitored
Water Framework Directive	ENV	EC: report on implementation of WFD and implementation progress in MS to parliament and council every 6 years MS: must send the EC River Basin Management Plans including report on programme of measures; water analysis and monitoring programmes (sent through WISE)	Common indicators for the ecological and chemical status, significant pressures and impacts on surface and groundwater bodies
Floods Directive	ENV	EC: Reports to the parliament and the council in 2018 and every 6 years after MS: Flood risk management plans produced and updated every 6 years (coordinated with WFD)	Objectives for the management of flood risk, maps of flood risk and land use
Nitrates Directive	ENV	EC collates information from MS and reports to parliament and council every 4 years. MS must designate NVZs and report to the EC on various aspects of implementation	Nitrates concentrations in water, eutrophication levels, impacts of the action programme; revision of NVZs and action programmes; estimations of future trends in water quality.
CAP Pillar 1	AGRI	EC: report on performance of CAP MS: indicators for CMEF, annual implementation reports	Range of indicators including farmland bird index, HNV farming, water abstraction, water quality, soil organic matter, soil erosion (impact indicators)
CAP Pillar 2	AGRI	MS: Conclusive reports; annual reports on progress, indicators for CMEF	

2.3.2.3 Financing

Most of the policies reliant on GBI to deliver their aims do not have ring-fenced EU funding but instead are funded nationally or through a range of EU funds depending on the actions required. The EAFRD is the largest source of funding for land management with specific environmental and climate aims. The EAGF, which funds Pillar 1 of the CAP could also be said to be relevant here though funding is less targeted. Clearly agricultural policy is the area with the most targeted funds since the policies themselves have funding attached to them.

Table 10. Shows the EU funds which can be used to support the policy instruments[1]. Dark green = ring-fenced funding, light green = available funding

	Cohe-sion fund	Struc-tural (ERDF and ESF)	EMFF	EAFRD	EAGF	Con-necting Europe	LIFE	Hori-zon 2020	Natio-nal funds
Size of fund (m €)	*74 928*	*256,000*	*6,397*	*95,577*	*312,735*	*21,936*	*3457*	*79,401*	
Cofinancing requirements	*Yes*	*Yes*	*Yes*	*Yes*	*No*	*Yes*	*Yes*	*No*	
Biodiversity strategy									
GI Strategy									
Nature Directives (Birds and Habitats)									
Climate and Energy Framework									
Climate Change Adaptation Strategy									
Water Framework Directive									
Floods Directive									
Nitrates Directive									
CAP Pillar 1									
CAP Pillar 2									

2.3.2.4 Involvement of stakeholders

Stakeholders are engaged in the policy process both formerly (through established stakeholder groups) an informally (through one to one meetings with policy makers, etc.). Table 11 shows the official groupings which deal with a particular policy area. The list focuses on the groups of relevance to GBI and is not exhaustive. Some groupings which focus on a range of policy areas for example are not included.

[1] http://ec.europa.eu/budget/mff/programmes/index_en.cfm

Table 11. Overview of stakeholder groupings focused on particular policies

Policy	Groups involving managing authorities	Stakeholder groups informing the EC
Biodiversity strategy	Co-ordination Group for Biodiversity and Nature Brings together the European Commission, Member States' representatives and various stakeholders (mainly NGOs) as well as the European Environment Agency to foster an exchange views and coordinate issues related to the implementation of the Nature Directives (Birds Directive and Habitats Directive) and the EU 2020 Biodiversity Strategy in particular the targets and actions therein.	
	EU Nature and Biodiversity Directors – high level representation from the Member States to take forward the Biodiversity Strategy and Nature Directives.	
GI Strategy	Working group on green infrastructure implementation and restoration – member state group which aims to compare experience and discuss implementation of the GI Strategy.	
Nature Directives (Birds and Habitats)	Habitats Committee and Ornis Committee – assist the European Commission in the implementation of the directives and deliver an opinion on the draft list of LIFE-Nature projects to be financed every year.	European Habitats Forum – representatives of environmental NGOs with an interest in the Directives
		Natura 2000 Users forum – representatives of land users with an interest in the Directives
	Biogeographic process – range of meetings in the Biogeographic regions which bring together managing authorities and stakeholders to discuss management of sites	
Climate and Energy	European Climate Policy Group - Assist the Commission in the preparation of legislative proposals and policy initiatives	
Climate Change Adaptation Strategy	Steering Group on Adaptation to Climate Change - Support the Commission in the preparation of the Communication on Mainstreaming Climate Change and Adaptation into Community policies; Contribute to the implementation of the EU's adaptation framework as set out in the White Paper.	
Water Framework Directive Floods Directive	Strategic Coordination Group for WFD and FDs. It is an Expert Group advising the Commission in technical preparations of implementing and delegated acts and also new proposals to be adopted through ordinary legislative procedure.	
	Common Implementation Strategy working groups focusing on a range of implementation issues.	
	Water Directors - high level representation from the Member States to take forward the WFD and FD.	
Nitrates Directive	Expert group on the implementation of the nitrates Directive - provides an informal forum of discussion between DG ENV and the Member States on technical aspects linked to the implementation of the nitrates directive and nutrients policy.	

CAP (Pillar 1 and Pillar 2)	Committees exist to ensure that the European Commission's responsibility for adopting implementing acts is exercised under the control of Member States. Committees include: the Common Organisation of the Agricultural Markets; Rural Development; Agricultural Funds; Direct Payments; Agricultural Structures and Rural Development; the Farm Accountancy Data Network; Conservation, Characterisation, Collection; Utilisation of Genetic Resources in Agriculture and the Expert group on monitoring and evaluating the CAP.	Civil dialogue groups assist the Commission and help to hold a regular dialogue on all matters relating to the CAP. Groups exist on: CAP, direct payments and greening, environment and climate change, forestry and cork, international aspects, rural development, as well as product and promotion based groups: (wine, animal products, arable crops, horticulture, olives and spirits, milk, organic farming, quality and promotion)

2.3.2.5 Policy timeframe overview

Policy	Adopted	Next steps	Description
Biodiversity strategy	(2001) 2010	2020	Target for when Biodiversity loss should be halted. An evaluation of process towards the target will be carried out.
GI Strategy	2013	2017-19	Guidance for the MS in implementing the GI Strategy is being developed. 2017 review of progress and report.
Nature Directives (Birds and Habitats)	1979, revised 2009 and 1992	2020	Assessment of progress according to aims of the Biodiversity Strategy relevant to the Directives
Climate and Energy	2008 and 2014	2020 and 2030	The Climate and Energy Package for 2020 was developed into the Climate and Energy Framework for 2030.
Climate Change Adaptation Strategy	2013	2018	Strategic evaluation currently being carried out and will report in 2018.
Water Framework Directive	2000	2021	The end of the first management cycle was 2015. The second management cycle is 2021. Final deadline for objectives 2027.
Floods Directive	2007	2019	Second flood risk maps.
Nitrates Directive	1991	2017	Next report on progress
CAP Pillar 1	1962	2021	CAP reformed every 7 years to coincide with the Multiannual financial framework. The next reform (CAP 2021-2028) is being discussed. Consultation started in 2016. Since then there has been an EC white paper released in November 2017.
CAP Pillar 2	1992	2021	

2.3.3 Policy objectives

2.3.3.1 Main aims related to GBI

Table 12 shows the main policy aims which are relevant to GBI aims and features. The policy aims are in some cases fairly specific to GBI (e.g. the habitats directive requires the protection of particular landscape features and habitats). Others are more generally related e.g. the CAP aims to increase the sustainability of EU agriculture. This could be achieved through a number of means not all of which are related to GBI.

Table 12. policy aims related to GBI

Policy	GBI-relevant aim
Biodiversity strategy	Maintain and restore ecosystems and their services, increase the contribution of agriculture to biodiversity.
Nature Directives (Birds and Habitats)	Protection of birds and species of European importance – Prevention of biodiversity loss, no net loss
	Protection of habitats of European importance – Prevention of biodiversity loss, no net loss
	Connectivity of Natura 2000 sites – More use of GBI especially connecting features
Climate and Energy Framework	Enhance climate-resilience, reducing vulnerability and mitigate the impacts of climate change
Climate Change Adaptation Strategy	Enhance the role of nature based adaptation (i.e. for the coherence of the Natura 2000 network)
Water Framework Directive	Achieve good surface water status
	Achieve good ground water status
	Prevent deterioration of water quality
Floods Directive	Take adequate coordinated measures to reduce flood risks
Nitrates Directive	Prevent nitrates from agricultural sources from polluting ground/ surface waters – restrict application of manure and fertilizers
CAP Pillar 1	Enhance the sustainability of EU agriculture
CAP Pillar 2	Restoring, preserving and enhancing ecosystems related to agriculture and forestry

2.3.3.2 Inclusion of the concept of GBI

The analysis aimed to include relevant policies even in the case that GBI (green infrastructure or natural water retention measures) is not specifically mentioned in the policy documents. Table 13 shows how GBI is included as defined by the project (GBI aims and GBI features).

Table 13. The table shows how GBI aims and GBI features are integrated into a range of policies The GI strategy is not included in the table since its focus is on GBI.

Policy	Specific mention of GBI	GBI features / connectivity	GBI aims / multifunctionality/ strategic planning
Biodiversity strategy	Target 2 focuses on maintaining and enhancing ecosystem services and restoring degraded ecosystems by incorporating green infrastructure in spatial planning.	Target 1, full implementation of the nature directives requires management and connectivity between habitats.	Target 2 also includes the concept of managing ecosystem services to deliver benefits to people.
Nature Directives (Birds and Habitats)	No, though it is included in the later Action Plan for Nature, People and the Economy which focuses on full implementation of the directives	Both directives require the management of habitats outside protected sites and make specific reference to connecting sites and connective features.	Not explicitly but there is recognition of social and economic considerations in the directives and particularly in the Action Plan.
Climate and Energy Framework	No	The LULUCF draft regulation makes reference to a range of GBI features such as forestry, grassland, cropland, wetland	Not a strong theme
Climate Change Adaptation Strategy	Aim to ensure the full mobilisation of ecosystem-based approaches to adaptation building on the Green Infrastructure Strategy.	No.	Ecosystem based approach to adaptation is a strong theme of the strategy as is establishing national planning and strategies to deal with adaptation.
Water Framework Directive	Not in the Directives however the Water Blueprint includes the concept of Natural Water Retention Measures which should be used to meet the objectives of the Directives.	Protection of aquatic ecosystems and wetlands included as an objective.	Ecosystem services not explicitly mentioned though ecosystems are the basic unit of the Directive.
Floods Directive			
Nitrates Directive	No.	Annex 2 mentions specific features to include in the code of good practice.	Not specifically.
CAP Pillar 1	No.	Ecological focus areas describe specific landscape features.	Not specifically but addresses economic, environmental and social issues.
CAP Pillar 2	No.	General aim of restoring, preserving and enhancing ecosystems related to agriculture and forestry.	Not specifically but addresses economic, environmental and social issues.

2.3.4 Feedback from the PRDN: Interviews

Through the interviews, a number of points were highlighted for further examination in the project. A particular area of interest at the time the interviews was carried out were amendments to the delegated regulation on the control systems (eventually adopted through delegated regulation 2017/1155) which was being discussed by the parliament.

Stakeholders expressed particular concern about the bureaucracy connected with encouraging farmers to maintain landscape elements. The fact that measures related to particular elements are included in greening, cross compliance, agri-environment measures and the nitrates directive was considered confusing particularly by farming interests. The need to provide paperwork for all of these systems and the range of control schemes, potentially managed by different managing authorities had the potential to cause confusion. In reference to greening in particular, both environmental and farming stakeholders agreed that the control systems were too strict, with a risk of penalising farmers for small measurement errors which would not impact the effectiveness of the policy which would not influence its environmental aims.

In terms of scientific needs, interviewees expressed a particular interest in how GBI features can be better located and joined up in an agricultural landscape. This is not incentivised to any great extent in Pillar 1 or 2 of the CAP. Additionally, joining up the aims of the different policy areas in order to deliver multiple benefits is regarded as being of prime importance. Lack of coordination and of working together particularly between DG AGRI and ENV is seen as a significant barrier in reaching many environmental goals.

2.3.5 Feedback from the PRDN: Focus groups

During the EEB focus group, the environmental NGOs taking part, focused particularly on the ineffectiveness of the greening measures. The experience from most Member States suggests that the GBI features which are included in the EFAs were there before greening was introduced and there is no incentive to improve management or create new features. The predominance of nitrogen fixing crops and green cover in most countries means that the benefits to biodiversity are expected to be minimal. Concerns were also expressed about the process of making policy decisions and particular the exclusion of NGOs from key expert groups and changes being introduced through non-transparent processes such as the inclusion of Miscanthus in the EFA which was introduced through the 2017 Omnibus regulation. On a more positive note, the ban on using plant protection measures for most EFA measures was welcomed by NGOs and they considered that this might encourage farmers to choose options other than nitrogen fixing crops and green cover.

The COPA-COGECA focus group was more interested in examining the potential impacts of the GI Strategy on farming practice and understanding the extent to which farmers are already providing GBI in the farmed landscape. Participants did not have any prior knowledge of the GI Strategy and it appears that on a national level, they have not been involved with its implementation. Participants recognised the list of GBI features as features that could be found on farms nationally but did not make connections to the EU policies, particularly the EFA features. Participants said that the CAP presented some barriers to putting in place GBI in particular, that the inflexibility of the rules does not recognise the changeability of natural features (e.g. wetlands growing and shrinking with rainfall). Having to provide exact measurements of the features for EFAs is counterproductive and prevents farmers from registering them in order not to expose themselves to penalties. Participants pointed out that farmers are not going to carry out activities which potentially jeopardise their Direct Payment. Important for their participation is that the payment regime provides some incentives; collaboration is encouraged and advice is provided for free.

3 Identifying GBI features included in policy

3.1 Background

As described at the start of chapter 2, GBI is a fairly diffuse concept with different meanings being assigned by different researchers, administrators and interest groups (European Environment Agency 2011).This definition however still leaves significant room for interpretation of what is considered a GI feature. The Staff Working Document accompanying the GI strategy (European Commission 2013c), acknowledges this issue:

> *"The types of physical features that contribute to GI are diverse, specific to each location or place and very scale-dependent. On the local scale, biodiversity-rich parks, gardens, green roofs, ponds, streams, woods, hedgerows, meadows, restored brownfield sites and coastal sand-dunes can all contribute to GI if they deliver multiple ecosystem services. Connecting elements are green bridges and fish ladders. On the regional or national scale, large protected natural areas, large lakes, river basins, high-nature value forests, extensive pasture, low intensity agricultural areas, extensive dune systems and coastal lagoons are just a few of many examples. On the EU scale, trans-boundary features such as international river basins, forests and mountain ranges are examples of the EU's supranational GI."*

Despite this difficulty in identify the specific elements of GBI, the EC has produced an overview of features considered as GBI on the various scales (Table 14). Whether they really are GBI, will depend on how they are placed in the landscape and consequently the benefits they can deliver.

Table 14. GBI elements on different scales ((European Commission 2013b)

Local or town/city scale	Regional and national scale	EU level	Descriptor
Natural and semi-natural ecosystems, such as pastures, woodland, forest (no intensive plantations), ponds, bogs, rivers and floodplains, coastal wetlands, lagoons, beaches, marine habitats	Extensive agricultural and forest landscapes, large marsh and bog areas, rivers and floodplains, shorelines/coastal zones	Freshwater systems, major river basins, mountain ranges, regional sea basins	Core areas – outside protected areas
Local nature reserves, water protection areas, landscape protection areas, Natura 2000 sites	Regional and National Parks and wilderness zones (includes Natura 2000 sites)	Ecological Networks with cross-border areas, incl. Natura 2000 network	Core areas/protected areas
Restored areas which were before fragmented or degraded natural areas, brownfield land or disused quarries; transitional ecosystems due to land abandonment or regeneration processes	Restored ecosystem types	Restored Landscape systems covering a substantial part of agricultural/forestry areas and industrialised sites, including cross-border areas	Restoration zones
High nature value farmland and multi-use forests (such as watershed forests); protection forests (against avalanches, mudslides, stonefall, forest fires), natural buffers such as protection shorelines with barrier beaches and salt marshes	Extensive agricultural landscapes, sustainable forest management on regional and national level, functional riparian systems	Transboundary landscape features on river basin or mountain range level, sustainable coastal and marine management zones related to the respective sea basin	Sustainable use zones
Street trees and avenues, city forests/woodlands, high-quality green public spaces and business parks/premises; green roofs and vertical gardens; allotments and orchards; storm ponds and sustainable urban drainage systems; city reserves incl. Natura 2000	Greenways, green belts, metropolitan park systems	Metropolitan areas with substantial share of high quality green areas in Europe, including coherent approaches in cross-border urban zones.	Green urban and peri-urban areas
Hedgerows, stone walls, small woodlands, ponds, wildlife strips, riparian river vegetation, transitional ecosystems between cropland, grassland and forests	Multi-functional, sustainably managed agricultural landscapes, riparian systems	Supra-regional corridors, substantial share of structure-rich agricultural, forestry or natural landscapes	Natural connectivity features
Eco-ducts, green bridges; animal tunnels (e.g. for amphibians), fish passes, road verges, ecological powerline corridor management	De-fragmentated landscapes, improved areas along transport and energy networks, migration corridors, river continuum	European-wide or transnational defragmentation actions	Artificial connectivity features

These type of features, joined to form a GBI network provide benefits to humans in the form of ecosystem services such as maintaining soil fertility or biological control. These benefits have been catagorised in a variety of ways by different authors see (European Environment Agency 2011; Mazza L. et al. 2011; European Commission 2013c). A summary of these various categorisations is provided by (Baró et al. 2016) who suggest the following benefit groups from GBI: (1) biodiversity/species protection and conservation benefits; (2) climate and climate changed related benefits; (3) water management; (4) food production and security; (5) recreation, health and well-being; (6) land and property values; (7) education, culture and communities; (8) investment and employment; and (9) natural resources.

The concept of GI as physical features fits well with the current idea of mapping ecosystem services (European Commission 2016a). The EEA carried out a spatial analysis to identify priority areas for conservation and restoration for GBI (EEA 2014). For this, the authors divided GI into two distinct categories: areas delivering medium to high ecosystem services (from a list of selected services) and areas which are important for biodiversity and connectivity of habitats. This process resulted in a map of GI for Europe on a landscape scale. The inclusion of areas of importance for biodiversity can be based on existing protected areas and the presence of particular habitats and species. Which areas are considered important for ecosystem services are however even more complex depending on which services are of highest priority to be delivered through nature based solutions rather than other interventions. In both cases political decisions are needed on which species, habitats and ecosystem services are of highest priority.

A number of outstanding questions remain, building on those identified by (Baró et al. 2016). Of particular relevance to the BIOGEA project are the following:

- How to adjust GBI between different spatial scales. For the EEA mapping, a regional approach was used. Adapting this to the local level is complicated. Depending on the species selected, different habitats and different levels of connectivity will be required. The requirements for large mammals (used for the EEA work) will be very different to the requirements of butterflies for example.
- How should the different areas identified as providing ecosystem services be linked. For some ecosystem services, connectivity may be very important but for others, patches of nature may be just as relevant as a connected network. Connectivity may not always contribute to enhancing ecosystem services (Mitchell et al. 2013).
- How to consider the counterfactual. Some features may be preferable to current land use but still not an optimal land use in terms of the biodiversity and ecosystem services which can be provided. An example might be nitrogen fixing crops which would provide climate and water services compared with an intensive arable crop but would potentially provide fewer benefits than conversion to an extensively managed pasture.

In BIOGEA, the opposite approach to the EEA work is taken with GBI first being measured on the very local scale through identified GBI features. This will then be scaled up to look at the impact on the regional, national and EU scale through modelling.

3.1.1 Objective

The objective of identifying GBI features is to:

1. Have a practical and workable definition of what are considered to be GBI features within the project and across the case study areas;
2. Agree a common list of features which link the policy analysis (WP 2) to the field work (WP 3) carried out in the case study areas;

3. Provide a broad overview of the potential benefits (or disbenefits) of the GBI features for biodiversity and ecosystem services to give a starting point for the more detailed examination of what the features provide in the specific circumstances of the case study areas and allow an examination of what difference the setting makes.

3.1.2 Definitions

In chapter 2, the GBI aims included in EU policy are explored. Here we examine the GBI features i.e. the physical building blocks such as pasture, hedgerows, ponds, bogs, etc. which together make up the GBI structure which itself provides habitat, allows movement of species between different habitats and supports a range of ecosystem services. .

According to the definition in the GI Strategy which has been adopted by the project, GBI features must be:

1. Natural and semi-natural areas and environmental features;
2. Deliver a wide range of ecosystem services;
3. Be strategically planned;
4. Be situated within an agricultural landscapes (for the BIOGEA project).

The strategic planning of GBI is considered to be part of the GBI aims i.e. something that is encouraged through policy. In this chapter, we examine the features which can be included under points 1, 2 and 4.

3.2 Methodology – identifying the GBI features and the benefits they provide

3.2.1 Identifying the GBI features

A range of different categorisation systems exist for categorising natural features (e.g. LUCAS, LISA methodology, CMEF). For BIOGEA a practical approach was taken in order to provide a list of features which were:

- identifiable in the case study areas (through field work)
- recognisable through remote sensing combined with other databases
- included in the policy instruments examined.

Agreeing the final list of GBI features within the project team, therefore involved a number of steps and input the policy team, the biologists and the modellers.

The list of features included in the GI strategy (see Table 14) was used as a starting point to identify those features of greatest relevance to the agricultural landscape were identified. As the EU policy overview was carried out, features included in the various policies relevant to GBI were added. For the initial steps, the focus was placed on small-scale features of relevance to the local to regional level. The features were sub-divided into categories depending on the type of farming system where they are likely to be present and the characteristics of the feature itself (Table 18). This list was then refined considering what features could be measured practically in the field and the potential of remote sensing data to make observations about the features in the wider countryside.

3.2.2 Characterising the agricultural systems

In some cases, a feature is clearly relevant to one particular type of agricultural system whereas others are present in the wider countryside. The GBI features were assigned to particular agricultural systems as follows:

- All agricultural systems
- Arable farming
- Livestock farming
- Perennial crops

3.2.3 Characterising the GBI features

The GBI features identified were further characterised according to their impact on or relationship to agricultural activities:

- In-field features which have a clear agricultural production purpose but also provide additional ES to food production. These include for example nitrogen fixing crops and catch crops but fallow which while not productive in itself is used to improve production potential.
- Small-scale landscape elements such as trees and ponds but which are not necessarily connected to one another.
- Connective features such as hedges and walls which are commonly found in agricultural landscapes and do not so obviously contribute to agricultural production but have traditionally been used to provide shelter and divide fields and may contribute also to pollination services, etc.
- Natural elements such as wetlands, commonly found on a larger scale within agricultural managed landscapes but not necessary part of the utilised agricultural area (UAA). Their proximity to agriculture means however that they are influenced by and potentially influence agricultural activities.

These groupings were used as a starting point to describe the potential impacts of the features on biodiversity and ecosystem services.

3.2.4 Identifying the benefits provided by GBI features

Identifying the benefits provided by a GBI feature in isolation is not definitively possible. The benefits provided by GBI features depend to a very significant extent on the geographical placing of a GBI feature, in particular, the surrounding landscape and how they are connected to other features. In addition, the management choices are essential to whether a feature provides ecosystem services or potentially ecosystem disservices. Finally whether a feature is considered beneficial or not, depends on what the alternative land management practice would be (Table 15).

Table 15 Aspects to consider when assigning benefits to GBI features

Factors affecting the benefits / disbenefits provided by a GBI feature	Explanation
Target benefits	GBI features may be extremely beneficial to certain species and detrimental to others (e.g. a hedgerow may benefits farmland birds but cause problems for wetland birds). Larger and more mobile organisms are more dependent on variation on the landscape scale, whereas sessile organisms are more affected by local changes (Concepción et al. 2012b). They may provide some ecosystem services and some ecosystem disservices. Whether a feature is therefore considered to provide benefits or not, depends on the policy goals set and the potential of a particular area for reaching these goals.
Biogeographical situation	Features, which are beneficial in a Northern European context for example, may not provide the same benefits in a Mediterranean context. For example, hedgerows and woody strips are likely to have a positive impact in mixed farming systems in most of West-, Eastern and Central Europe, where forest species may be present in agrosystems but may have a negative impact in dry cereal croplands in Spain or vast open grasslands in Central/Eastern Europe. The LUCAS survey showed clear differentiation between landscape structures across the EU (Palmieri et al. 2011) and how these relate to traditional agricultural practices.
Relationship to other GBI features	One of the parts of the EC's definition of GBI is that it should be a strategically planned network. In the agricultural landscape, farmers often act in isolation so that the features on one farm may not link with the next. The benefits provided by a feature may depend very much on whether they are linked to other features to provide a network (e.g. Beier, Noss 1998b). The importance of connectivity of features and scale varies between different species.
Situation in a more or less intensive agricultural landscape / complexity of existing landscape	Diversity in the agricultural landscape can be considered to mean both diversity of GBI features and heterogeneity of land cover (Palmieri et al. 2011). The benefits provided by GBI may depend significantly on what is already there in the agricultural landscape and how complex it already is. In general new measures will provide the greatest benefits in landscapes of intermediate complexity (Concepción et al. 2012b).
Status quo and counter-factual	A related point is what would be carried out on a particular piece of land in the case that the GBI was not there. For example, nitrogen fixing crops or green cover can be considered to provide both water and climate ecosystem services compared with an intensive arable crop but would potentially be a negative change compared with maintaining the land long-term in pasture.
Management choices	How the GBI feature is managed also makes an essential difference to its importance for biodiversity and ecosystem services. If a grass margin for example, is left longer term and not treated with fertilisers or plant protection products, the ecosystem services it provides are likely to be much greater. The size of the feature also makes a difference to its effectiveness.

Given these considerations, instead of carrying out a detailed literature review for every GBI feature as was originally planned, the BIOGEA team decided to provide a rapid overview of the potential benefits and disbenefits provided by the groupings of GBI features based on a number of meta-reviews, described in more detail in Table 16. It should be noted, that the majority of the studies included in these reviews are based on information collected in north and west Europe and may not apply fully to the more extensive landscapes included in the BIOGEA case studies in Bulgaria and Spain. In general, the evidence for the impacts on species and habitats is much more thoroughly researched than the evidence for impacts on ecosystem services (EIP-AGRI 2016).

Table 16. Meta-reviews used to gather information on the GBI features

Reference	Description
Dicks et al. (2013)	Provides a synopsis of the conservation evidence compiled from a wide range of data sources for interventions in the farmed environment and their impacts on farmland wildlife. A systematic review of the literature was carried out starting with a list of 1157 references (collected using a peer review search protocol). The evidence collected focuses on northern and western Europe. The interventions are based on agri-environment measures as applied in the UK.
Bues et al (2013)	This study focuses on protein crops and their impacts on the environment using a literature review and analyses the role of protein crops under the CAP, its potential for the delivery of environmental benefits as well as related strategic policy options.
EIP-AGRI (2014)	The results of an EIP AGRI Focus group focusing on the multifunctional management of permanent grassland for economic and environmental benefits, especially regarding biodiversity and carbon sequestration/climate change mitigation. It provides an structured overview of different issues related to grasslands and especially of management practices and issues regarding profitability and impacts on biodiversity and climate mitigation.
Tzilivakis et al. (2015)	An extensive literature review to form the foundation of the Environmental Focus Area calculator (commissioned by JRC). The review examined over 350 papers, reports and guides and structured the findings around the 19 individual EFA elements. Impacts on both biodiversity and wider ecosystem services (based around the CICES) were collected.
EIP-AGRI (2016)	The results of an EIP AGRI Focus group focusing on EFA features and how they contribute to the profitability of arable farming by providing ecosystem services. The report focuses on field margins, hedgerows and grassy or flower strips. The focus group collected together existing information and evaluated it in a participatory process.
Nitsch et al. (2017)	A handbook produced for the German Federal Agency for Nature Conservation (BfN) which provides information for farmers on the different EFAs, the evidence for their effectiveness and the measures which can be taken in order to maximise the benefits they provide particularly with reference to biodiversity but also for other ecosystem services.
Pe'er et al. (2016)	Used an expert survey approach to collection information from 88 ecologists in the EU and Switzerland on the biodiversity benefits or disbenefits likely to result from the options included in the Environmental Focus Areas.
Underwood, Tucker (2016)	Review of the available literature to look at the likely impacts of nitrogen-fixing crops, catch and cover crops on biodiversity and compare them with the biodiversity potential of landscape features and fallow. The focus was on wild native species and protected species, particularly those specialised on farmland habitats.

For each of the groups of GBI features, the aspects shown in Table 17 were considered.

Table 17 Information included in the description of GBI features

Section	Description of information
Description	An overview of what links the GBI features included in a particular group.
Importance in European landscapes	A qualitative and quantitative description of how common the group of features is and in what geographic areas it is concentrated.
Benefits for species and habitats	The benefits for habitats and species as highlighted in the reviews listed above. In general the impacts on species included in the EU Nature Directives and particularly farmland species are considered. Most reviews focus on farmland birds followed by pollinators.
Benefits for ecosystem services	The CICES categorisation of ecosystem services (see D2a) was used as a starting point for the ecosystem services considered for each group of features. Based on the policy aims of GBI "protecting and enhancing nature and natural processes" and the environmental policies relevant to GBI, the focus was placed on the benefits for water, soil and the climate.
Agronomic benefits	The agronomic impacts were considered to include further provisioning ecosystem services including the direct impact on production potential, pest control and pollination. The impacts on commonly used agricultural techniques (e.g. the effort to manage a feature) were also considered.
Factors affecting uptake	This section gives a brief overview based on the literature of why farmers might chose or not to manage GBI features on their farm.

3.3 Results – the GBI features

Table 18 shows the GBI features and groupings of features and how they are included in the EU policies relevant to GBI. This is a development of the list included in the Assessment Framework (D2a) following discussions within the project team which were used to refine the list.

Table 18. GBI features included in BIOGEA. The table shows both policies influencing and policies reliant on GBI production.

			Policies influencing GBI						Policies relying on GBI		
Policy instruments			CAP Pillar 1					Pilllar 2	Environmental policy		
			EFA	permanent grassland	Arable diversification	cross-compliance	agricultural land definition	RD	WFD / FD	Nitrates Directive	Nature Directives
Policy aims			Enhance the competitiveness and sustainability of agriculture					Help rural areas meet challenges sustainably	Good water quality / reduced flooding	Protect water quality	Favourable Conservation Status
GBI elements (field to farm scale)		**Land use**									
Category	**Feature**										
Landscape elements											
	Isolated trees	All agricultural systems	x			x	x	x			x
Trees	Trees in groups and field copses	All agricultural systems	x			x	x	x			x
Ponds	Ponds	All agricultural systems	x			x	x	x	x	x	x
In field elements connected with productive agriculture											
Grasslands	Maintain permanent grasslands and pastures	Livestock farming		x			x	x	x		x
	Areas with short rotation coppices	Perennial crops	x				x	x			
Agroforestry / orchards	Agroforestry / orchards	Perennial crops	x				x	x			x
	Areas with catch crops or green cover	Arable farming	x		x		x	x	x	x	
Cover crops	Areas with nitrogen fixing crops	Arable farming	x		x		x	x	x	x	
Fallow	Land lying fallow	Arable farming	x		x		x	x			
Connective features											
	Buffer strips	All agricultural systems	x				x	x	x		x
	Field margins	All agricultural systems	x			x	x	x			x
Grassy strips	Strips along forest edges (no production)	All agricultural systems	x				x	x			x
	Hedges and wooded strips	All agricultural systems	x			x	x	x			x
Hedges and wooded strips	Trees in lines	All agricultural systems									
	Traditional stone walls	All agricultural systems	x			x	x	x			x
	Terraces	All agricultural systems									
Walls / ditches	Ditches	All agricultural systems	x			x	x	x	x		x
Semi-natural elements											
	Wetland / bog	Livestock farming		x			(x)	x	x		x
Wetlands	Floodplane	Livestock farming		x			(x)	x	x		x
Heathlands / schrubs	Moor / shrubland	Livestock farming		x			(x)	x	x		x
Grasslands	Environmentally sensitive pastures	Livestock farming		x			x	x	x		x

3.3.1 Historical development of GBI features in Europe

Compared with other continents, Europe is heavily populated and Europeans have a long history of living within a farmed landscape. Agriculture is the dominant European land use and accounts for nearly half of the total EU land area. The development of agriculture over millennia, has resulted in a European flora and fauna which has adapted to agriculturally associated ecosystems. The GBI features included in BIOGEA are either part of traditional agricultural practice (e.g. fallows) or developed alongside agriculture (e.g. wetlands).

The changes in the second half of the twentieth century, precipitated by technical developments as well as policy pressure through the CAP as well as national policies, led to an unprecedented increase in agricultural productivity. To increase productivity, external inputs such as fertiliser and pesticides were increased and farming systems were simplified and specialised to single products. As mechanisation increased, so could the size of the farms and scale of the fields meaning that the density of boundary features was reduced. These changes which resulted in an increase in "provisioning" ecosystem services, however came at the cost of a decline in landscape diversity (Meeus 1993) and a loss of non-crop features and the biodiversity and other ecosystem services such as carbon sequestration, nutrient cycling, soil structure and functioning, water purification and pollination associated with them (Stoate et al. 2009). Losses of GBI features were particularly high in the 1970s and 80s in the UK for example. In other countries, the consolidation of agricultural holdings has continued and increased, especially in some of the newer EU Member States. Policy changes in the last decades such as the introduction of agri-environment schemes and more recently cross compliance and greening may have some impact on slowing the loss of features but have not stopped it (Stoate et al. 2001).

3.3.2 Description of GBI features

In the section below, we describe the four categories of GBI feature included in the project (see Table 18):

- Landscape elements (isolated trees, trees in group, ponds);
- In-field elements connected with productive agriculture (grasslands, agroforestry/orchards, cover crops, fallow);
- Connective features (grassy strips hedges and woody strips, walls and ditches);
- Semi-natural elements (wetlands, heathlands/shrubs, environmentally sensitive pastures).

Landscape elements

This category includes a range of small scale semi-natural elements in an agricultural landscape. These are distinguished from connective features in that they are not linear and from semi-natural habitats in that they are small in extent and are normally connected directly with farming practice (in a similar way to linear features). In this category, we have included some woodland elements (individual trees and small groups of trees) and ponds but unploughed corners of fields, remnant parts of hedges, rocky outcrops and even traditional farm buildings might also be locally important (Dicks et al. 2013).

As with linear features, small scale features can provide habitat within an intensively farmed landscape. Instead of corridors, such features can be regarded as patches or stepping stones. Certain species are reliant on habitat corridors but others which are more mobile can move from one stepping stone to another, allowing migration or change of range in response to climate change (Saura et al. 2014). Even fairly isolated features have the potential to provide some benefits, depending on their structure. Fischer et al. (2010) describe the disproportionate value of

scattered trees for birds and bats. Such trees can be regarded as keystone structures which provide highest benefits for these species at intermediate densities. Davies et al. (2008) highlight the value of ponds compared with other aquatic habitats which on a regional level may have an importance for rare species higher than rivers in some regions. Depending on the landscape structure, management of the feature and the particular benefits desired, smaller scale features can be of significant importance.

Importance of landscape elements in the EU
The LUCAS survey provides an overview of landscape features in the agricultural context. The survey is carried out through means of transects where features are noted. Features of relevance include: grassland with sparse trees, shrubland with sparse trees, rocks and stones, water bodies. There is no aggregation of data specific to small-scale landscape elements though the datasets for the individual survey points can be examined. In addition, the information collected does not tell us anything about the position of the elements in the agricultural landscape. More information should be available with the inclusion of the EFA-layer in IACs though only in the case that features are included within the EFA. In 2015, features were already included even if their locations are not mapped in all Member States. 144,780ha were declared as EFAs in 2015 (European Commission 2017e) which makes up 1.7% of the total EFA area in 2015.

Trees, copses and ponds have been protected through cross compliance since 2003. They are only included if they are counted as part of the agricultural area. Now that they are also included in the EFA, there may be more incentive to include them in the agricultural area, though there are strict rules on the maximum size of such features. In some member states, the creation of features may be included in agri-environment schemes.

More information on the types of landscape including many individual features is available for particular locations where targeted surveys have been carried out. Relevant landscapes may for example include areas where agro-forestry has been carried out in the past or now, where agricultural landscapes commonly include individual trees or groups of trees such as the Dehesas included in the Spanish case study for BIOGEA. In general, these types of landscape are more common in areas where cold temperatures (Boreal or Alpine) or droughts (Mediterranean) are a problem and they therefore provide clear benefits to agriculture (Mosquera-Losada et al. 2012).

Ponds in the agricultural landscape were previously common in many countries but they have not been systematically measured over time. The Pond Society has gathered figures for select countries: Switzerland 32,000 small waterbodies; UK 100,000; Denmark 120,000 and France 1 million but the size used to define ponds vary between the different countries (EPCN 2008). In some countries, ponds used for aquaculture are common in the agricultural landscape, particularly in Central and Eastern Europe though figures as to their extent are difficult to come by.

In-field elements connected with productive agriculture

In field elements are part of the productive agricultural landscape. They have clear agronomic purposes even when not directly productive themselves, e.g. “land lying fallow” has a specific function in the agronomic production cycle. In field elements are considered as GBI features because they provide ecosystem services or benefits to biodiversity that go beyond what a crop alone would provide. By definition, these features are on the field scale thought their size and regional extent vary.

The effectiveness of in field elements in supporting ecosystem services delivery and biodiversity varies. The impact on biodiversity and ecosystem services relies for a great part on appropriate management practices. It depends for example on species sown, sowing wildflowers on land lying

fallow or a mix of species in catch crops has a greater positive impact on biodiversity. It depends on coverage too, leaving the soil bare on land lying fallow has the lowest positive biodiversity impact. The type of management of the crops, for example the frequency or intensity of cultivation in nitrogen-fixing crops is also very important.

Importance of in-field elements connected with productive agriculture in the EU

In-field elements have high potential to be affected by policy incentives since in general crops can be changed relatively easily from year to year. Exceptions are agro-forestry and to some extent pasture which require longer term planning. The types of crop appropriate, clearly depend on the biogeographical situation of the farm. Crop extent across the EU is measured through the Agricultural Census carried out every 10 years. In between, Farm Structural Surveys are carried out every 2 or 3 years but they only sample a proportion of farms.

A distinction is made between environmentally sensitive semi-natural grassland and pasture in this categorisation due to their different management requirements as part of greening. Permanent grasslands cover 60,840,280 ha across the EU, representing 16% of the total land area and 34.6% of the total Utilized Agricultural Area. The highest shares are found in Ireland, the UK, Greece and Portugal (EIP-AGRI 2014). Permanent grasslands in Europe are in decline due to intensification of practices, specifically conversion of grassland to maize or arable crops on land which can be easily cultivated and afforestation and abandonment in less productive areas. Incentives to maintain permanent grassland are included in cross compliance. This requirement has been maintained as a part of greening in the CAP since 2014. Member states are required to maintain the ratio of permanent grassland to total agricultural area to 95% of what it was in 2015 at the national, regional or even farm level. Almost all member states have decided to apply the permanent grassland greening measure at national level, except from Belgium, France, Germany and the UK that have chosen to implement this rule at the regional level (European Commission 2016c). Ploughing of environmentally sensitive permanent pasture is banned (see semi-natural elements section).

The extent of protein crops in the EU has varied significantly with changes to the CAP incentives over time. In the 70s and 80s the production of particular nitrogen-fixing crops enjoyed price-support. Following decoupling, this has been removed though nitrogen-fixing crops have continued to be supported through recoupled schemes in pillar 1 and agri-environment in pillar 2. Indirect incentives such as subsidies for oil seed rape for biofuels have also impacted the attractiveness of growing nitrogen-fixing crops (Bues et al 2013). In 2015 legume crops made 2.1 % of the total arable area of the EU, being grown on 2.2 million hectares (EUROSTAT 2015). The areas covered by nitrogen-fixing crops vary greatly between member states. Catch crops areas are not specifically monitored at EU level in agricultural statistics but both nitrogen-fixing and catch crops make an important share of the declared EFA area across the EU (45,4% of the physical area on the ground and 27,7% respectively (European Commission 2016c).

Incentives to maintain fallow land have also varied over time with changes to agricultural policy. In particular, the requirement to keep set-aside land to control production levels meant that over a significant period, farmers maintained a significant percentage of their land as set-aside. With the removal of this incentive in 2007, the amount of fallow land has decreased. In 2015, it made up 3.9% of arable land in the EU (EUROSTAT 2015). The introduction of the EFA has increased the attractiveness of fallow land, it is currently the third most popular option, making up 21,2% of the total physical area of EFA (European Commission 2016c).

Agroforestry systems cover approximately 15.4 million ha in Europe, representing almost 9% of EU agricultural land (EIP-AGRI 2017). Livestock agroforestry makes the greatest part with 15.1 million hectares compared to 358 000 ha of arable agroforestry (den Herder et al. 2017). Traditional orchards are a specific type of agroforestry system which has been used by farmers for centuries

for different purposes. In the first half of the 20th century it covered around 2 million hectares across Europe, concentrated particularly in France and Germany, followed by Switzerland, Austria, Slovenia, Poland, England, Belgium and Spain. The area of traditional orchards is estimated to have decreased by 20 % in the last 20 years. Additionally, traditional orchards are threatened by abandonment, the majority of trees not being sufficiently maintained and pruned regularly. Short rotation coppices are still covering a relatively small area in Europe compared to other crops on arable lands, few ten thousands hectares in few countries such as Sweden, Italy, Poland, Germany – however with a predicted rapidly increasing tendency (Dimitriou et al. 2011).

Connective features

Connective features (such as hedges, stone walls, tree lines, ditches and other watercourses) are defined as small scale linear elements in an agricultural landscape. Linear features are of particular interest in the context of GBI as they may, under the best circumstances, provide corridors for migration and a GBI network between semi-natural areas. Isolated populations in small patches of habitat are much more vulnerable to extinction than those which can migrate. Connecting areas through “wildlife corridors” is regarded as important to avoid the isolation of small populations in patches of habitat. They have been found to enhance the movement of species through fragmented landscapes, particular in the context of intensive arable farming (Beier, Noss 1998a).

A number of studies have shown that relatively small-scale features can provide benefits for insects, spiders and small mammals which may not be able to cross open spaces as well as maintaining a certain level of plant diversity as they are generally not heavily fertilised (Dicks et al. 2013). The benefits for species which can migrate more easily are less certain. Linear features can also provide benefits for water resources, when they are located along the edge of a water body and protect it from runoff from agricultural products or eroding soil (Snoo 1999). The effectiveness of the features depends to a large extent on their length and width and how they are managed. The benefits in a less intensively farmed landscape (e.g. in extensive grassland) are less clear (Concepción et al. 2012a).

Importance of connective features in the EU
Linear features are the result of historical farming practices generally dating from the time that agricultural land was reorganised and enclosed. The features had the purpose of marking the boundary lines to private land and controlling livestock. The types of boundary feature typical in a region depend to a large extent on the natural resources of the area and the climatic and other challenges typically faced in farming but also the history of land ownership.

The types of features are therefore not entirely geographically predictable, nonetheless certain patterns can be observed: In general, there are more linear features in North and Western Europe (highest in Ireland and lowest in Hungary and Slovakia). Hedges are common in Northwest Europe, particularly the United Kingdom, Ireland, parts of Belgium and France. Tree lines (avenues or allies) are maintained in Denmark Belgium, Ireland, France, the Netherlands and Germany. Dry stone walls are common in Malta, Portugal and Poland. Terraces are common in Southern Europe e.g. Spain, Portugal and Greece and are used to increase the agricultural area rather than create a barrier.

The LUCAS survey in 2010, has provided an overview of landscape features in the agricultural context. The survey was carried out through means of transects where features were noted. Around 47% of the transects included at least one linear feature (Palmieri et al. 2011). There is however currently no mapping of them on a farm level. As an overview, around one million holdings maintain hedges; 750,000 maintain trees in lines, 660,000 maintain stone walls. Thanks

to agri-environment schemes, in some countries, hedge establishment has also increased with around 150,000 holdings establishing hedges (EUROSTAT 2013). Linear features have also been protected through cross compliance since 2003. With their inclusion in EFA, it may become more attractive to include them in the agricultural area. Member states must include them in the EFA-layer in IACs in 2018, so more information about their placement should become available then.

Semi-natural elements

Given its scale and importance in Europe, agricultural land use has an impact which extends more widely than on the fields where production occurs. In BIOGEA, semi-natural elements are used to describe larger areas of habitat which have been formed through many years of coexisting with traditional agricultural practice and may either be included in or external to modern farm holdings. Such features include high nature value grasslands, heathland, scrubland and a range of different types of wetlands.

Such semi-natural areas are important both in themselves in that they provide a habitat for many open-land and woodland species as well as various ecosystem services. On a regional scale, they also help to increase the heterogeneity of the landscape, often described as essential for many farmland species (Benton et al. 2003). Several studies have focused on the importance of remnant islands of natural and semi-natural habitats to enhance ecosystem services on the landscape scale in an otherwise depleted agricultural landscape (Concepción et al. 2012a). The relative importance of remnant semi-natural areas compared with the type of agricultural practice carried out in-field may depend on the priorities for conservation management e.g. for sessile species, in field management may be most important whereas for mobile species, having semi-natural refuges from which farmland can be accessed may be more valuable (Gonthier et al. 2014).

Whether the aim of agricultural policy should be to leave as much semi-natural to natural habitat untouched while intensifying production on the richest farmland; or whether it is better to maintain extensive farming over a wider area, has been discussed in detail as part of the land sharing-land sparing debate (see for example (Phalan et al. 2016)). At its most extreme, this represents on the one side the idea that food production and the provision of ecosystem services occur simultaneously across the whole landscape and on the other side, that areas are separated out or zoned for productive agriculture or nature protection. Many researchers, however believe that, in Europe at least, a combined approach is desirable but that considering how ecosystem services are produced from the local to the regional scale is essential when targeting management practices (Tscharntke et al. 2005).

Importance of semi-natural elements in the EU
In Europe, little completely natural habitat exists and most protected habitats and habitats regarded as important for protected species are in fact semi-natural. Semi-natural habitats which are considered of community importance in the EU are measured as part of the birds and habitats directive reporting so that there is a reliable overview available of their status and trends (though for many species still, statuses are not known). Article 11 of the Habitats Directive, requires Member States to undertake surveillance of the 233 habitats and more than 1250 species considered to be of Community interest and article 17 requires that they submit regular reports on progress made implementing the directives. The Commission produces synthesis reports (EEA 2015) which includes results presented by Member State and biogeographic region but also grouped by the different ecosystem types of the MAES (Mapping and Assessment of Ecosystems and their Services) typology (European Commission 2016a). This typology is used below to give a brief overview of the status of the ecosystems which are most related to agricultural activities. It should be noted that only protected habitats within these ecosystem types are included in the figures below so they may underrepresent the complete ecosystem.

From the ecosystem groupings of habitats, those most closely related to agriculture are grasslands (which cover around 10% of the EU land area) and heathland and shrub (covering about 7% of the EU land area). Both are semi-natural habitats which are amongst the most species-rich in the EU. Both have undergone major declines in recent decades and both require intervention to maintain them. Grasslands and heathland and shrub ecosystems are still facing considerable threats. Under the habitats directive, the status of habitats and species must be measured and categorised as being favourable, unfavourable-inadequate, unfavourable-bad or unknown. Grassland and heathland species are calculated as being respectively 64% and 50% in unfavourable status with a worse picture still for related habitats (also because fewer habitats are included in the unknown category) of 86% and 75%. For both ecosystem groups, the major pressure / threat on species is change of practice driven by agriculture (both abandonment and intensification).

Bogs, mires and fens are of high importance in terms of their biodiversity even though their extent is now small (2% of the EU land area) and are often part of an agricultural landscape even if they are not farmed directly. 67% of wetland related species are assessed as being in unfavourable status and 84% of wetland related species. The main threat for species is modification of wetland conditions which may have a number of causes. While some types of agricultural activities are benign or may even be required to maintain a wetland (e.g. removal of shrubs, harvesting of reeds), others, particularly drainage or overgrazing are likely to negatively impact the hydrological regime.

Semi-natural habitats included in the agricultural area are covered by the requirement to maintain the percentage of permanent grassland introduced by cross compliance in 2003. An additional requirement under greening is that environmentally sensitive permanent grasslands (ESPG), including peat and wetlands must not be ploughed or converted. The definition of pasture has also been widened to allow the inclusion of non-herbaceous forage in the case that the use of this fits with traditional practice. Member States can decide how they define ESPG and most have chosen the Natura 2000 area or in some cases (e.g. Germany), only Special Areas of Conservation designated under the Habitats Directive. In the first year, only five Member States decided to additionally designate areas outside Natura 2000 as ESPG (Belgium, Czech, Latvia, Luxembourg and Wales). This means that the designated area likely to be less extensive than the areas considered High Nature Value pasture. ESPG represents 16% of the total grassland area in the EU. Within Natura 2000, 75% of permanent grassland is designated as ESPG, with significant variability between Member States. However, only 40% of the permanent grassland in Natura 2000 is declared ESPG by farmers. Again, there is significant variability between member states, with some declaring almost all of the designated areas (e.g. HE, RO, FI, SE) and others declaring less than half (e.g. BG, CZ, ES, IT, CY, LT, UK).

3.3.3 Ecosystem services potentially provided by GBI features

Table 19. Overview of GBI features and their potential benefits / disbenefits for biodiversity, ecosystem services and agronomic benefits

	Description	Biodiversity	Ecosystem services (especially water, climate, soil)	Agronomic
Individual landscape features				
Isolated trees	Individual trees within parks, pastures or cropland have been a feature of agricultural landscapes for millennia and may be present for agronomic reasons (e.g. providing shelter) though they are not directly used for production. The benefits they provide are likely to depend on the age of the tree and its structure and size.	A wide range of species including birds, mammals and arthropods, depend on trees, isolated (or otherwise) as a food resource, shelter and/or nesting site. Old remnant trees which include a basal hollow which can be used for roosting bats, nesting birds and climbing mammals are particularly valuable. Tree architecture is therefore of great importance for use by birds. For less mobile species such as insects and plants, the links with other habitats may be more important.	The ecosystem services provided by groups of trees and hedges is likely to be greater, however even individual trees can provide a buffer against soil acidity, increase soil fertility and increase filtration of water into the soil. This may be particularly valuable in dry habitats.	Trees can provide benefits such as shelter or shade for stock. The transfer of water through the trees root system can also be important for drought avoidance. On the other hand, the immediate production potential of the area directly around the tree may be reduced and harvesting made more difficult.

	Description	Biodiversity	Ecosystem services (especially water, climate, soil)	Agronomic
Individual landscape features				
Trees in groups / copses	Areas with groups of trees and / or woody shrubs and plants which are not used for agricultural production.	Copses and shrubs provide similar benefits to large hedges though there has been little direct research. They are valuable for woodland birds, bats, arthropods and small mammals. On the other hand, they can provide a refuge for predators which can reduce the value of an area for wetland or grassland species. In general, they are more valuable if they are connected to other areas of habitat or to field boundaries.	Benefits include the reduction of wind-borne soil erosion and thus the amount and rate of soil runoff into watercourses. Overall water run-off may also be slowed thus contributing to flood prevention measures in susceptible areas.	Similar benefits in terms of shelter, shade and moisture retention to individual trees. The productive area lost is however greater.
Ponds	Ponds can be permanent or seasonal small water bodies both natural and manmade. Natural pond systems provide a wide range of habitats including a range of depths and surface areas. Manmade ponds are unlikely to provide such a range of habitats but can still provide valuable ecosystem services.	Ponds are important for a range of species such as amphibians, macroinvertebrates and macrophytes. In the Mediterranean region, temporary ponds, which dry up over the summer, are also a valuable habitat and are included as a specific habitat in the Habitats Directive.	Ponds can help to reduce run off and reduce erosion. They may act as a nutrient sink, absorbing phosphorus and nitrogen in more intensively farmed landscapes.	Ponds can be of direct agronomic use for example for irrigation, livestock watering, erosion control and fire preparedness. They may also add to off-farm diversification activities such as tourism or aquaculture.

	Description	Biodiversity	Ecosystem services (especially water, climate, soil)	Agronomic
In field features connected to productive agriculture				
Permanent grasslands and pastures	Grassland is land used to grow largely perennial grasses or other herbaceous forage (naturally or through cultivation), the same grass/herbaceous forage. Pastures are grassy or wooded areas, moorland or heathland generally used for grazing. Permanent grasslands in Europe differ widely in their vegetation composition and in the farming systems linked to them. Some of the main types are: - Silvopastoral: (can be considered as agroforestry); - Scrubs: high biomass, low nutritional quality - Scrubs and herbaceous: medium-high biomass, medium nutritional quality; - Natural herbaceous with heathlands: medium biomass - Natural and improved vegetation: medium biomass - Improved vegetation: high quantity and quality of nutritional biomass.	A wide range of birds, invertebrates and mammal species use different types of grassland as their main habitats depending on the speices present and intensity of management. Biodiversity benefits are expected where grasslands are maintained over the longer term with limited inputs of fertilisers and plant protection products. Regular ploughing or reseeding will damage the biodiversity value of permanent grasslands, however, the overall impacts on vegetation and associated animal communities of restoring/creating grassland vary according to local circumstances (e.g. soil type, vegetation type and condition, stocking rate, climate, historical management and current management objectives) and the scale considered (from field to farm or region).	Land that is maintained as permanent grassland and not ploughed or reseeded, potentially has climate mitigation benefits through the maintenance of carbon stores in the soil. Depending on the type of livestock production occurring on the land, it could however, result in net GHG emissions. Grasslands may improve water regulation and filtration (reduce water surface flow and improve infiltration to the soil; provide increased water retention and storage of water during temporary floods; protect water quality by trapping sediments and assimilating nutrients) compared with cropped land.	Dairy production is the most profitable way of grassland utilisation, followed by livestock meat production. As seen in the grassland types in column 1, there is likely to be a trade-off between the nutritional quality and quantity of the biomass produced for animals and the value of grasslands for biodiversity and ecosystem services. That said, some HNV grasslands have agronomic advantages. They often occur in areas with little other agronomic value and the quality of the final product (e.g. specialised cheeses and meats) is often high.

	Description	Biodiversity	Ecosystem services (especially water, climate, soil)	Agronomic
In field features connected to productive agriculture				
Agroforestry systems including traditional orchards [2]	Land-use systems in which trees are grown in combination with agriculture on the same land with a maximum number of trees per hectare.	Agroforestry systems provide habitat for a diverse range of wildlife and show high levels of plant, arthropod, earthworm and vertebrate diversity from plot to landscape scales. Traditional orchards offer different ecological niches (in/on trees, on meadows) as habitat for several species, from tree-dependant or forest species to specialists of semi-open and open landscapes. A German case study found the potential for plant biodiversity being higher in mown orchards than in grazed or abandoned ones, but no effects on wasps or bees.	Agro-forestry systems can show additional carbon sequestration compared to agricultural land without trees. In comparison with crops, they show reduced input needs, reduce erosion and improve soil structure and fertility. They can potentially provide water quality protection because of the rooting system of trees that captures nitrate in the ground and may protect against nitrate pollution in ground water. Some positive impact is expected on crop pest controlling. Agro-forestry can provide landscape and have recreational value compared with intensively cropped fields.	Production diversification, with at least two products instead of one (fruits, timber, crops, livestock production especially); the mix of trees and crops is expected to increase productivity. Studies suggest that ago-forestry can bring important economic benefit with the appropriate choice of species and management depending on the regional context. Production costs may be lower because of reduced input needs and may thus enhance profitability of the systems. Traditional orchards require low inputs, low labour but also lower fruit production (10t/ha of apples) compared to more intensive practices (30-50t/ha). This can be to some extent compensated through grass production and a longer life cycle. Profitability potentially high depending on processing and valorisation by farmers (direct market).

[2] For agroforestry see EIP-AGRI 2017; den Herder et al. 2017; for traditional orchards see Esto, 2017; Staatliche Naturschutzverwaltung Baden-Württemberg 2014

	Description	Biodiversity	Ecosystem services (especially water, climate, soil)	Agronomic
In field features connected to productive agriculture				
Short rotation coppice	Densely planted areas, with specific, fast growing tree species (e.g. willow or poplar) for production of wood harvested on a 2-5 years cycle usually for production of energy. Eight-metre wide rides along the crops as well as headlands at the end of each area are required for machinery access and these may be sown with grass.	Dicks et al. captured no evidence for the effects of managing short-rotation coppice to benefit wildlife. SRC can however create additional landscape structure and habitat for wildlife and can be useful for connectivity when spatially combined with other landscape elements such as hedges, trees in line and in field trees. A negative impact on biodiversity is to expect if planted on species-rich meadows or fallow land or open areas used as resting spaces for wildlife.	When planted on productive land, the following benefits can arise for ecosystem services: Protection against erosion and improvement of soil organic matter content; protection of water quality because of reduced use of pesticides and fertilisers; reduction of emission of nitrous oxide and storage of carbon in soil and by accumulation of litter material. Negative impacts can be expected on sites with a sensitive water balance (strong water demand of short-rotation coppice plantations).	Production of wood; can be an economically beneficial option on low-yield sites; the work load is high when agricultural production work load is low so that it may well fit in the farming system from a timing point of view. Some positive impacts on erosion protection of the soils in near fields can be expected. The measure requires multi-year commitment so only likely to be viable where a long-term market locally is secured.

	Description	Biodiversity	Ecosystem services (especially water, climate, soil)	Agronomic
In field features connected to productive agriculture				
Catch-crops or green cover	Mixture of productive crops and/or grass planted on a temporary basis following a productive crop to protect soils and use available nutrients during the autumn winter.	Generally low effects on biodiversity compared to other EFA. Provide food and refuge for wildlife compared to bare land; provide food for insects if it comes to flower in late summer – however limited use for insects at that period of the year. Negative impacts of catch crop for insects or small mammals e.g. when sowed directly after the harvest of the main crop (lack of resources such as pollen) and because of soil ploughing in preparation of the catch crop. Catch crop stay in place for a relatively short time and do not allow insects and other wildlife to find habitat for reproduction.	Contribute to protection of soil against erosion and improvement of soil structure and soil organic matter content. Reduce nutrient leakages and potential for reduced pesticides use if green cover is maintained (because of reduction of weed growth).	Interesting for farming systems with small areas, good water resources and rotation of appropriate crops (main crop and catch crop have to be combined appropriately) Brings benefits in form of agronomic production on the area. Limit soil erosion and improve soil conditions but can induce pest/diseases.

	Description	Biodiversity	Ecosystem services (especially water, climate, soil)	Agronomic
In field features connected to productive agriculture				
Nitrogen fixing crops	Productive leguminous plants, including e.g. lupin (*Lupinus*), clover (*Trifolium*), alfalfa (*Medicago*) or beans like *Vicia faba*. These contain symbiotic bacteria *Rhizobia,* within the nodules of their root systems, producing nitrogen compounds that help the plant to grow and compete with other plants. The nitrogen is released to the soil after the plant dies, thus acting as a fertiliser.	The relevance of legume crops for protecting biodiversity is low in comparison to other GBI features such as field margins or buffer strips and are not considered as generally having a high biodiversity value. Impacts depend on the flowering habits of different legume plants, some of which are favourable for pollinating insects and therefore contribute to the maintenance of wild and domestic bees. There may also be benefits to soil fauna diversity and diversity of small mammals, birds and insects.	Impacts on ES are limited when compared with the impacts of other GBI features such as landscape elements in field or on small scale (hedges, isolated trees, field margins, etc.). Improved water infiltration reducing OR increasing effect on nitrate leaching depending on management of crop residues and use of other crops after the nitrogen-fixing crop as well as depending on location of the n-fixing crop Reduction in CO2 emissions and increased soil carbon sequestration compared with other crops. Improvement of soil structure, soil organic matter content and nitrogen fertilization of the soil	High protein grain for food and feed. Lower crop yield of protein crop (compared with cereals) but increased yields of subsequent non-legume crops (depending on crop combination and farming system) because of the expected reduction in pest and diseases and the improvement of soil properties such as fertilization of the soil as well as organic matter content and structure. The combination of nitrogen-fixing crops with other crops within a farming system has to be considered (e.g. take into account pre-crop and break-crop effects of legumes).

	Description	Biodiversity	Ecosystem services (especially water, climate, soil)	Agronomic
In field features connected to productive agriculture				
Land lying fallow	Land without any crop production or grazing for at least 6 months, maintained for production in the following years.	higher densities of farmland birds have been observed in case studies of fallow land provide nest and food opportunities for birds, insects and small mammals as well as small game. Potential for natural regeneration of wild plants potential to improve connectivity of semi-natural and natural landscape elements. Bare land has little biodiversity value.	Soil protection, especially in land lying fallow for several years. Protection of water quality because of no use of pesticides and fertilisers. Storage of nutrients especially in land lying fallow for several years, due to the continuous green cover.	Can be used by farmers as a component of crop diversification and built into a rotation. Can reduce pests and crop disease outbreaks. Productive area is reduced if land is lying fallow, but the costs are also reduced (especially for land lying fallow with natural grass regeneration/growth).

	Description	Biodiversity	Ecosystem services (especially water, climate, soil)	Agronomic
Connective features				
Grassy strips – buffer strips, field margins, strips along forest edges	Often in the form of margins between a field and a boundary structure such as water body, hedge, fence, road or wood. Can be left to regenerate naturally, or sown, typically with a grass-rich or floristically enhanced seed mixture. Can therefore contain a variety of plant communities in a variety of structures.	Relatively undisturbed habitat for farmland species. Wider range of plants, birds, mammals and insects than cropped areas. This is generally due to a higher plant species richness due to less intensive management. Foraging space for breeding and wintering birds providing a range of plant and invertebrate food sources. Can also promote connectivity between areas of semi-natural landscapes and provide corridors for small species such as butterflies and moths.	Can help control sediment, phosphorus, nitrogen and pesticide losses to surface waters. In particular useful for controlling runoff from farmed fields and removing nitrogen in the proximity of watercourse. Small potential to sequester carbon compared with a cropped field and improve the structure of the soil.	Can reduce the area available for production and present a weed risk. Margins are however often located on less productive land at the edges of other features. Margins can however also act as a source for pollinators and both invertebrate pests but also natural pest controllers (biological control).

	Description	Biodiversity	Ecosystem services (especially water, climate, soil)	Agronomic
Connective features				
Woody strips and hedges	Hedgerows or woody strips can be made up of a range of woody species. Their impacts on biodiversity and ecosystem services depend on, their age and structure, the species and diversity of different species of which they are made up, their placement e.g. whether they are connected to other wildlife areas and their management, in general that they are cut every two years outside the bird breeding season and are not sprayed with plant protection products.	Pollinators, bumblebees and butterflies prefer to follow features such as hedgerows rather than cross open land. Insects, birds and bats benefit from a dense shrubby layer within a hedge as well as individual trees. A hedgerow composed of many tree species is likely to benefit a wider range of animal species. Flowering plants within hedgerows and have significant benefits for pollinators.	Overall likely to have a provide ecosystem services compared with no hedge in an agricultural landscape. May reduce soil erosion and nitrogen runoff. Hedges take up nitrogen and then release it to the soil again when the leaves fall. They also have the potential to sequester carbon to a slightly larger extent than grassy strips without woody vegetation.	May reduce crop production near to the edge of the hedge. Protect crops or animals against wind and its effects and mitigate excess heat. In windy areas, the overall effect on crop production is judged to be beneficial.
Walls, ditches, terraces	Common in areas where rocky outcrops are a feature. Sometimes have an earth bank at the bottom. Older walls which have been left to develop lichens without too much interference are likely to provide greatest benefits. In Southern Europe, terraces are more common and again benefits are likely to be linked to age and condition. Ditches are artificial features.	Walls and terraces may provide a niche habitat for certain plant species and where left over longer time periods, for insects and foraging farmland birds. Ditches can provide some benefits of aquatic biodiversity in an otherwise intensively farmed landscape depending on the extent to which pesticides and herbicides are used nearby. All are linear features which can provide corridors for smaller invertebrates in an otherwise open landscape.	Walls and terraces can potentially provide some sediment control though this depends on their management and the amount of vegetation surrounding them. Depending on how they are located, ditches can increase run-off. They can also potentially increase release of carbon from pasture if this leads to a drying out of carbon rich soils.	Walls, terraces and ditches have clear agronomic purposes though they may not always fit with modern farming practice. As with hedges, the have the potential to provide shelter from wind and sun. Ditches are used to drain productive land though if they are frequently cleared, this is likely to reduce their potential environmental benefits.

	Description	Biodiversity	Ecosystem services (especially water, climate, soil)	Agronomic
Semi-natural elements				
Wetland	Wetlands can vary in their nature and hydrological make up. They include mires, bogs and fens. Since by their nature they are saturated by water either permanently or seasonally, they are entirely dependent on the surrounding hydrological regime and will be rapidly impacted by changes in management affecting water flow. Depending on their nature, they may be rainfall fed or linked to the surround river network.	A wide range of protected species are highly dependent on wetlands including wetland birds such as the Eurasian curlew *Numenius arquata* and the bittern *Botaurus stellaris* or amphibians such as the European fire-bellied toad *Bombina bombina*. Most wetland species are declining though there have been some reversals thanks to targeted conservation actions funded to a large extent by the LIFE programme.	Wetlands can help stem water flows and absorb eroded materials and nutrients. Depending on their management, they can also potentially regulate how water is released downstream, mitigating flood events. Wetlands such as bogs can also provide important climate regulation services. Again, depending on management, they can be either a significant source or a significant sink for greenhouse gases. In general, they are more likely to be a sink if they maintain their water levels and vegetative layers.	Wetlands generally do not have a direct agronomic use though wet meadows are traditionally used for livestock grazing. The advantages they provide in terms of water storage may also have the benefit for the farmer that they protect more valuable cropland from flooding. However, farmers may also prefer other water management techniques such as straightening rivers to maximise the most productive areas. Converted wetlands can provide highly productive land for farming though this use conflicts with the provision of other ecosystem services.
Environmentally sensitive grassland	Environmentally sensitive grasslands are natural and seminatural (extensively managed) grasslands as opposed to other types of grassland which can be reseeded and ploughed. Grasslands are widely distributed in the EU, although natural grasslands only exist naturally above the treeline in mountain areas or at high latitudes; in other areas, grasslands are semi-natural and without human activity would transition into woodland	Permanent grasslands are of particular value for supporting biodiversity. A wide range of grasslands are included as protected habitats under the habitats directive. Mediterranean grasslands for instance are a global biodiversity hotspot. Extensively managed grasslands can contain a wide range of plants and insect species and consequently a rich feeding sources for many birds and mammals.	Grasslands and pasture maintained over the long term, have a high potential for carbon sequestration, but with a large uncertainty; Below-ground organic materials of permanent soil cover (e.g. roots, soil invertebrates, etc.) represent an important carbon pool). Long term grassland and pasture can also help to regulate water flows and reduce erosion.	Grasslands are mainly used for livestock production with potential for some limited biomass production. There is some evidence that high nature value grasslands can improve the flavour of agricultural products such as dairy products or meat. However, protein levels are lower and consequently such grasslands cannot maintain a high headage of livestock.

	Description	Biodiversity	Ecosystem services (especially water, climate, soil)	Agronomic
Semi-natural elements				
Heathland and shrub	This ecosystem type covers heathland, shrub and tundra (vegetation dominated by shrubs or dwarf shrubs), including moors and sclerophyllous vegetation including both coastal and inland types. They are mostly secondary ecosystems which rely on continued human management. In the case that they are natural ecosystems, they generally exist under unfavourable natural conditions which prevent tree growth (wet, cold or high latitude).	Shrubs and heathland are important for a wide range of species. Nearly 143 species listed in the Habitats Directive are linked to heath and shrub ecosystems including reptiles, mammals and birds. Shrubland is also often the first stage of natural succession after farming is abandoned. In these cases, species reliant on open land can be lost as shrubs return.	Shrublands can provide some benefits for the water environment in particular preventing runoff and erosion. They can also absorb carbon. Heathlands and shrubs may sometimes present a fire risk.	Shrubland and heathland have coexisted with farming activities for millennia and particular species of shrub and heath can provide valuable traditional fodder for livestock. Other activities connected with these habitats include collection of fruit and use of woody material or reeds. As with hedges, shrubland can also provide habitat both for agricultural pests and for natural pest removers.

3.3.4 Factors affecting uptake and extent of GBI features

Preliminary figures on the uptake of measures supporting GBI features, including the implementation of EFAs, already exist for the first years after the greening reform of the CAP (European Commission 2017e; Alliance Environnement and the Thünen Institute 2017). The European Commission's analysis shows that the features declared by farmers for complying with EFA requirements are mainly those that originally had a farming purpose. In fact, the EFAs most declared across the EU are in field elements connected to productive agriculture: nitrogen-fixing crops, accounting for 45,4% of the EFA area on the ground, catch-crops with 27,7% and land lying fallow covering 21,2 % of the declared EFA area (figures from 2015) (European Commission 2016c, 2017e, 2017d, 2017c, 2017b, 2017e, 2017e, 2017e, 2017e).

Several recent studies focusing on greening and its implementation, identify the main factors that are very probably inducing the uptake of productive features by farmers rather than of e.g. landscape features (Pe'er et al. 2016; EIP-AGRI 2016; Nitsch et al. 2017), being as follow:

- easy administrative tasks such as declaration and compliance to monitoring and control, compared with other EFA types;
- small (/smaller) sanction risk compared with other EFA types;
- low opportunity costs for farms compared with other EFA types;
- possibility of integration within existing farm production system;
- existence of the areas concerned and thus no need for new creation of EFA areas on farm.

The incentives to create new EFAs instead of declaring existing areas EFA are regarded as being low. The strict requirements on length and size of landscape features may mean that they are not recorded by farmers as EFA. Such shortcomings in the design and implementation mechanisms of greening have been pointed out at several occasions and acknowledged by the European Commission (ECA 2017). The European Commission reacted with several simplifications. In particular, Delegated Regulation 2017/1155, amending Delegated Regulation (EU) No 639/2014 reacted to the specific problems above, attempting to incentivise farmers to declare more landscape features (simplifying categories, introducing more flexibility in terms of dimensions and location of features, reducing the mapping requirement in EFA layer, among others). Further changes were introduced by the so-called Omnibus regulation 2017/2393 which made changes to the Basic Regulation 1307/2013 (see BIOGEA Briefing no. 2 for more information).

The interaction with other policy incentives may also influence the attractiveness of EFA measures. For example, if the EFA elements are included in cross-compliance measures this may impact their uptake by farmers positively. The potential to combine EFA measures and agri-environment measures funded by the Rural Development Programmes can also influence behaviour. Often, however, farmers report that the incentives received through different policy drivers do not encourage coordinated activities (see feedback from the BIOGEA Focus Group, Annex 2).

More generally, the literature points at both economic and socio-cultural or individual determinants of farmers' ability and willingness to adopt or maintain sustainable practices. Several studies analysed the factors affecting farmers' uptake of environmentally-friendly practices, including motives for participating in agri-environmental schemes (Krom 2017), behavioural research on farmers' motivation to implement EFAs (Menozzi et al. 2015) or more globally farmers' ability and willingness to engage with the goals of biodiversity policies (Siebert et al. 2006). In their review of over 160 studies, Siebert et al. noted that besides the economic and organisational aspects that strongly influence the choices of farmers, socio-cultural and behavioural factors such as attitudes, social norms and expectations, past behaviour or social and cultural capital should gain more attention since they are also key determinants of farmers' behaviour. Past behaviour with regards

to environmental issues seems to influence the farmer's intention to engage with environmental measures in future (Menozzi et al. 2015). The moral dimension of implementing sustainable practices, influences farmers' attitudes and actions, although to a lesser extent when measures are compulsory, as it is the case for the EFA requirements (Menozzi et al. 2015).

The stakeholders' views gathered via the PRDN interviews and focus groups also address this issue of implementation of greening on the ground and farmers uptake of EFA measures. Many of those engaged through the PRDN believed that while greening of the CAP was an appropriate mechanism for encouraging farmers to manage and produce GBI, the problems with its implementation are such that environmental stakeholders, at least, believed that it has no future in further iterations of the CAP. Particularly problems included the following:

- Controls being too strict and penalising farmers for errors which have no negative environmental effects which effectively put them off choosing the more beneficial measures;
- Lack of incentives to choose the more environmentally beneficial measures (the weighting does not encourage this);
- Lack of incentives to take positive actions rather than just maintaining the status quo, particularly the formular of income foregone and additional costs for agri-environment-climate measures;
- Lack of incentives for farmers to work together to join up greening or agri-environment measures – participants suggested that a higher payment for collaborative actions would be appropriate;
- Lack of qualified advice with knowledge of the environment and GBI and in the case that advice is available, the cost of advice.

4 Discussion and identification of critical implementation aspects

After an introduction in Chapter 1, we overview in Chapter 2 the EU policy framework, examining how ten policy frameworks from a long list of seventeen are of relevance to GBI. In particular, the characteristics of policies, likely to contribute to their effectiveness are assessed as well as their aims relevant to GBI. In addition, stakeholders have been engaged through the PRDN to provide feedback on the relevance of the assessed policies and their future potential. In Chapter 3, we present a list of GBI features for the BIOGEA project based on an assessment of the type of features present in agricultural landscapes in Europe, combined with an overview of how these features are included in the EU policies relevant to GBI and a practical assessment of their measurability in the field. This list will be used as a basis for the fieldwork carried out in WP 3. An initial overview of the benefits or disbenefits the features can give for biodiversity and ecosystem services based on a number of meta-reviews is provided.

In this chapter, we:

- draw the findings together in a discussion of policies and policy coherence related to GBI at EU level;
- identify the critical implementation aspects for the effectiveness of the policies;
- describe briefly how these most important factors are to be included in the next steps of the project.

4.1 Discussion

4.1.1 CAP biggest influences of GBI in the agricultural landscape

This initial overview suggests that, both Pillar 1 and Pillar 2 of the CAP have the greatest potential influence on agricultural GBI. Agriculture has been a main driver for the loss of biodiversity over the last century through intensification of agricultural activities on existing farmland and conversion of natural land into cropland. Recent reviews of European biodiversity and water policies found that agricultural practices are the most significant barriers to their targets being met (European Commission 2015a), (Milieu et al. 2016), (European Commission 2015b). Much of this development has historically been driven by agricultural policies which promote provisioning ecosystem services (food production) at the expense of all other ecosystem services. The CAP remains the largest EU fund related to land use and also the fund with the least subsidiarity (Pillar 1 is not co-financed) although Member States have greater flexibility with implementing the CAP in its latest iteration.

The CAP is a well-established policy with a strong institutional framework led by DG AGRI supported by a range of expert and stakeholder groups which examine different aspects of the policy. Monitoring and reporting are well established with clear responsibilities for the managing authorities in the member states in terms of annual reporting. The integration of reporting for Pillar 1 and Pillar 2 through the Common Monitoring and Evaluation Framework (CMEF) is a clear improvement on previous versions of the CAP. In addition, further environmental indicators have been integrated such as farming intensity and conservation status of grassland.

The Biodiversity Strategy, Birds and Habitats Directives, WFD, Nitrates and Floods Directive were all judged as having moderate influence on agricultural GBI. These are all regulations or directives with fairly strong legislative frameworks and the potential for the European institutions to take action in the case that member states do not appropriately translate and implement them. Monitoring and reporting requirements are also clear and well established. In terms of their aims for GBI, the policies are complementary (see below), however they are managed by different DGs within the Commission, the policy timeframes vary and the monitoring requirements are not fully

integrated. This may mean that in practical terms, the complementarities are not exploited as well as they could be.

The main reason these policies are ranked lower than the CAP in terms of their influence on GBI, however, is that they lack the strong financial backing afforded to the CAP. The dedicated environmental fund, LIFE, is more than one hundred times smaller than the CAP. It is regarded as a source of financing for pilot actions which can then be rolled out more widely using CAP and other ESIF financing rather than as a fund for meeting the aims of the policies themselves. There has been some effort to coordinate financing to meet the aims of the Birds and Habitats Directives through the Priority Action Frameworks (PAFs) which member states are required to produce. However, the PAFs do not serve to ring-fence funds for biodiversity. For water objectives (WFD, floods and Nitrates), nothing similar to the PAFs exists to coordinate spending through different instruments.

Climate change policy was judged as having less of an influence on GBI than other environmental policies. The adaptation strategy has an advisory character. It aims to bring together the work carried out by Member States and facilitate a common approach and the sharing of information. It is not however backed up by a strong legislative framework, monitoring or evaluation. The climate and energy framework (2030) has the potential to be of relevance to GBI in the future because of the inclusion of Land Use, Land Use Change and Forestry in greenhouse gas emissions accounting for the framework. The framework is however, not yet in place.

4.1.2 Environmental policy instruments rely strongly on GBI

Reliance on GBI was analysed through an examination of the overall policy objectives as well as the specific aims for GBI for each policy. Specific mention is made in the more recent policy instruments, e.g. the Biodiversity Strategy (2011) has an aim to establish green infrastructure; and the Water Blueprint (2012) requires the development of guidance and targeting of funding towards Natural Water Retention Measures (NWRM), described in the blueprint as a type of green infrastructure. To ensure that older instruments were included in the analysis, the inclusion of targets for GBI features or the concept of natural features delivering multiple aims was also considered to be of specific relevance to GBI. For example, connecting GBI features (habitats) to deliver better environmental results is a requirement of the Habitats Directive (1992) (article 10), which requires the protection of features connecting protected sites.

The GI Strategy itself is the policy most clearly reliant on GBI. This may seem banal but the strategy is designed to make use of other policy instruments in order to deliver its aims to conserve and enhance Green infrastructure. The Biodiversity Strategy and Habitats Directive were also categorised as being highly reliant on GBI. This did not mean in every case that specific mention of GBI was made but that the aims and intentions were clearly linked to the concept of GBI (e.g. specific GBI features or aims were mentioned). The Birds Directive was found to be less clearly linked than the Habitats Directive because the concept of connectivity between protected sites is less clearly included as a requirement of the Directive.

The Climate Change Adaptation Strategy makes reference directly to GBI and the concept of multifunctional use, however there is no specific mention of GBI features. Climate change mitigation policy does not include specific aims for GBI to any significant extent.

The Water Directives (WFD, FD and ND) are all regarded as being moderately reliant on GBI based on their aims and objectives. While the linking action plan (the Blueprint for water) makes specific mention of GBI (or NWRM as they are described in the Blueprint), the Directives themselves do not include GBI features or aims specifically in their documentation.

The CAP is also regarded as being moderately reliant on GBI to meet its aims. The environmental aims of the CAP are fairly unspecific. Enhancing the sustainability of agriculture (Pillar 1) and enhancing agricultural ecosystems (Pillar 2) should help to meet the aims of the above-mentioned environmental legislation. The most specifically mention of GBI features is in the Pillar 1 features which can be included in Environmental Focus Areas (EFAs). The Pillar 2 documentation does not actually list any GBI features, though it can be assumed that the AEC measures should support GBI features.

4.1.3 Lack of EU Policy Coherence regarding GBI

In terms of the GBI related aims, the GBI relevant policies appear to be coherent. The aims do not contradict one another and in general should reinforce one another. Conflict or incoherence is more apparent in:

- the governance structures;
- monitoring and evaluation;
- the timeframes.

Concerning the governance structures, the policies examined are divided between different DGs and examined by different parliamentary groups. The member states and expert groupings are different. Often the stakeholder representatives in Brussels may be those most involved in the development of a range of different GBI relevant policies, though they are also often fairly specialised. This is confirmed by the stakeholders' feedback gathered via the PRDN.

A general point observed during the discussions with the PRDN was that those engaged, often had a great deal of experience of a particular policy area but few could talk about both GI and the environmental regulations behind the concept and agricultural policy. This reflects the way the policy areas are divided by the European Commission and particularly the separation of the activities carried out by DG AGRI and DG ENV.

The national stakeholders involved through the focus groups tended to be specialists in the environment or agriculture and not always involved in the details of policymaking. While the EEB group was interested in changes in the CAP, many were not highly involved with its implementation in their Member State. It was clear from the COPA-COGECA focus group that the participants had had very little exposure to the concept of GBI and had not been engaged in developing their national GBI strategies. Farmers' representatives at the meeting could recognise the GBI elements presented as natural features present on farms, but did not relate them either to greening (though they include all the EFA features) or to the concept of GBI itself. This suggests that farmers are not aware of all the greening measures that exist and that the GBI concept is neither widespread nor self-explanatory. This should be taken into account for BIOGEA while progressing further "down" from the EU to the national and local level in WP 3.

Lack of coordination between the policy areas is particularly evident in the policy timeframes which have largely been developed independently of one another. The windows of opportunities for influencing the various policies are time limited and subject to change based on external factors for example the parliamentary elections and Brexit. The level of scrutiny afforded to the different policy areas depends on their financial significance more than the importance of their aims. For example, the targets for the new WFD cycle after 2021 or the biodiversity strategy targets after 2020 are likely to be agreed after the main decisions on the new CAP are made, despite the fact they will rely on this for their financing. A better overview of the policy timetable would be of use for many stakeholders engaged in the policy process and this should be considered in BIOGEA's WP 5 which includes briefings and policy recommendations.

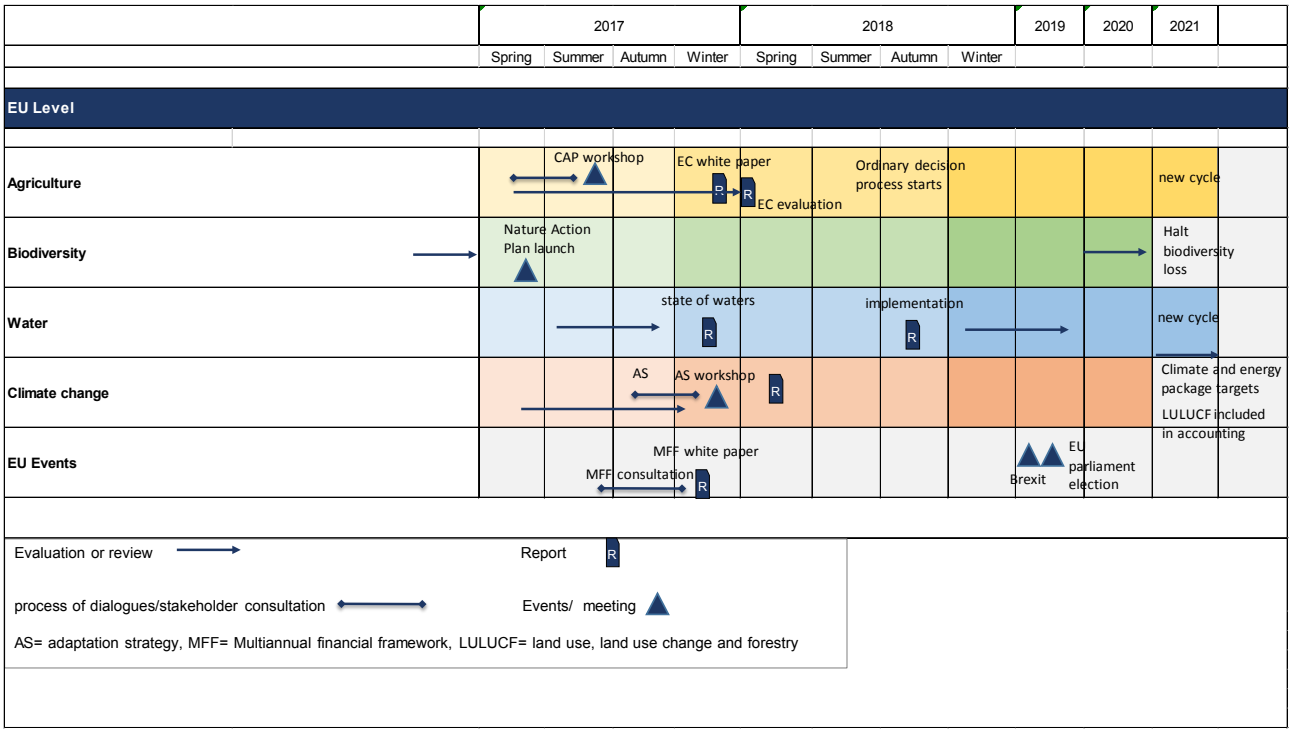


Figure 6. Timeframe for GBI relevant policies

4.1.4 Discussion of the policy making process

Figure 6 shows a broad overview of the timetables for the various policies however, while the main milestones may be accurate, changes have been made to the CAP outside the formal negotiations for the reform. Unusually, there have been changes made to the basic as well as the delegated regulations of the CAP to respond to the concerns of Member States and stakeholders regarding greening and particularly to the Commission's own greening review after one year (European Commission 2017e).

Commission Delegated Regulation (EU) 2017/1155 (European Commission 2017a) amends Delegated Regulation (EU) No 639/2014 (European Commission 2014), making changes to Article 45 (greening requirements under EFA). These include a ban on plant protection products for productive EFAs, clearer specification of the minimum period for plant cover for elements such as catch crops or land lying fallow and administrative simplification with the aim to support/incentivise the declaration of landscape features such as hedges or field margins as EFA.

Further changes were included in the 2017 Omnibus regulation (European Commission 2017f) which amends the financial regulation governing the implementation of the EU budget as well as 15 sectorial legislative acts, including in agriculture. In particular, the changes make the distinction between active and non-active farmers optional; make the rules on permanent grassland more flexible; include further areas in the EFAs (areas farmed with plant varieties such as silvergrass (Miscanthus) and silphion (Silphium perfoliotum), as well as land left fallow for melliferous plants); and change the weighting factors[3] for nitrogen-fixing crops and short rotation coppice (see BIOGEA Briefing 2 for more information).

The results of the EU-level PRDN engagement address these policy-making issues. In particular, the findings from the focus groups showed that stakeholders are critical of the policy-making

[3] The multiplication factor allocated to show what percentage of a crop counts towards the EFA area.

process. They pointed at a lack of transparency about which stakeholders were involved in decisionmaking and in the publication of documents. The following points were made:

- Environmental interests said that they had been excluded from the expert groups which were established before the Commission presented their initial views on the CAP (Agricultural Outlook Conference, 2016);
- Important documents such as the impact assessment of the proposals were not discussed with stakeholders or publicised;
- Certain documents such as guidance on implementing the EFAs for Member States appear to have been produced but are not publically available;
- Changes to the current implementation rules had been made without engaging stakeholders in the decision-making process (particularly the Omnibus regulation) or providing the draft documentation publically.

4.2 Critical considerations for the next steps

This deliverable provides a structure for the policy analysis carried out at the EU level which will inform the analysis carried out in the case studies on the national/ regional level and in the case study areas themselves locally. A number of points must be considered when adapting the analysis to the different governance levels and progressing towards the next steps.

1. Focus on the CAP – the analysis and documentation review suggests that the CAP and in particular greening have the potential to have the greatest influence on GBI in the agricultural landscape. The analysis in the Member States will therefore focus in most detail on Pillar 1 of the CAP, with some information on the opportunities provided by Pillar 2.

   The GI Strategy is the policy most reliant on the provision of GBI (through a range of activities) in the agricultural landscape. The review of environmental policies will therefore start from examining the national GI Strategies where these exist as well as scanning the other environmental policies for activities specifically related to the project definition of GBI.

   Next step: national level policy analysis in the case study member states – link with WP3, WP5 and WP6
   - Template for Country files describing how the GBI relevant policies are translated into national policy in Bulgaria, Germany and Spain, including
     - CAP national implementation choices and policy making process (including timeframe, stakeholders and governance structures in the country);
     - GI strategy/concepts;
     - Biodiversity (Biodiversity Strategies and EU Nature Directives), Water, Climate change adaptation – scan of the policy documents and administrative structures.
   - The PRDN will be engaged on the national level to cross check the findings and identify further nationally relevant initiatives.

2. Follow EU policy-making process – The reform of the CAP is ongoing and a large amount of work is going into evaluating the CAP and producing recommendations for the future. A number of relatively minor changes have been made to the regulations since the start of the project. In this ever-changing policy environment, the continued engagement of the PRDN in the project is essential.

   Next step: Ongoing consideration of EU-level policy-making process – link with / to feed in WP5 and WP6
   - Next policy Briefing proposed on ongoing changes 2014-2017 and their implications;
   - Policy briefing on the outcomes of the national policy analysis;
   - Continue to work with PRDN at EU-level (participation at EU-level events of stakeholders and presentations of Biogea progress at EU-level events).

3. Consider measures outside greening – Greening and the process of putting it in place has been severely criticised by a number of stakeholders. It is still uncertain to what extent it will be included in the future CAP. To remain policy relevant, it is essential that BIOGEA does not focus too narrowly on greening but includes an assessment of all broad and shallow measures which are of relevance in the wider countryside whether they are supported through greening, agri-environment-climate or some other mechanism (e.g. CAP Pillar 2, cross-compliance).

   Next step: consideration of broad and shallow measures in CAP besides greening – link with policy recommendations in WP5 and WP6

4. Case study fieldwork – We are not aware of a direct assessment of greening measures through fieldwork. The LISA project appears to be the only assessment which aims to measure features in the landscape before and after without directly linking this to what greening measures have been taken up where. The reform of the CAP is therefore taking place without this knowledge. Based on the list of GBI features identified in this deliverable, information on the most important GBI structures and the impacts of a variety of land uses on GBI, biodiversity and ecosystem services will be gathered through the biological field monitoring (task 3.3). Information on policy implementation will be gathered through interviews with famers and stakeholders (task 3.2).

   Next step: case study area policy analysis of implementation – WP3, link with WP4, 5 and 6
   - Template for case study regions describing background information including
     - Regional agricultural characteristics;
     - Regional GBI characteristics and;
     - Regional institutional characteristics.

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6 Annex 1: Interview timetable

Date	Name	Position	Organisation	Catagory
27.02.2017	Katerina Tomkova	Policy Advisor - Economic Analysis, Direct Payments & Greening	COPA COGECA	Farming representative
27.02.2017	Valentin Opfermann	Policy Advisor, Environmental issues	COPA COGECA	Farming representative
28.02.2017	Vujadin Kovacevic,	Policy officer	DG ENV, D2 Biodiversity Unit	Authority
01.03.2017	Claire McCAMPHILL	Policy Officer - Implementation Water Framework Directive & water policy	DG ENV, C1 Water	Authority
01.03.2017	Emmanuel Petel Andrea Furlan	Policy coordinator Policy officer	DG AGRI, D2 Cross compliance and greening	Authority
01.03.2017	Trees Robijns Thomas Quinn	Senior EU Agriculture and Bioenergy Policy Officer EU Agriculture and Bioenergy Policy Officer	BirdLife	Environmental representative
28.03.2017	Faustine Bas-Defossez	Policy Manager for Agriculture and Bioenergy	EEB	Environmental representative
29.03.2017	Caroline Raes,	Evaluation officer	DG AGRI, C4 Monitoring and evaluation	Authority
29.03.2017	Alessandra Sgobbi,	Policy Officer	DG CLIMA, A3 Adaptation	Authority
17.07.2017	Julie Raynal	Policy Officer	DG ENV, D2 Biodiversity	Authority

7 Annex 2: Minutes from focus groups

EEB agriculture working group, 18 October, Brussels.
The group was made up of EEB member organisations (environmental NGOs) from different MS. BIOGEA was allotted a one-hour slot in the meeting.
Kajsa Pira, SE ; Leif Back Joergensen, DK ; Johannes Linnet, DK ; Lavinaia Roveran, DE ; Faustine Defossez, EU ; Stephan Piskol, EU ; Alejandro Javier Criado, EU ; Maria Velikova, BG, FNE ; Andrejs Briedis, LV ; Eduardo Santos, PO ; Andre Prescher, DE ; Trees Robijns, DE ; Ingrid Kjellandder, SE ; Patrick Nuvelstijn, NE ; Tapani Veistola, FI ; Angelika Schobinger, AT, Cristina Kontaxi, EL

Focus group
Introduction to the project 10 minutes.
2 break out groups with the members allocated randomly looked at the following questions:

1. Policy implementation in the Member States
The first group was asked the following questions:

d. Which Pillar 1 choices (list provided on white board) by MS most influence GBI and how?
e. Impacts of the flexibility given to MS (e.g. management requirements attached, ability to make changes over time)
f. Recommendations for improvements of instruments?

In general, the group members agreed that currently greening and pillar 1 delivers very little for GBI and that EFAs are really the only measure that could deliver. The biggest problems are as follows:

- Many farmers are exempt from greening;
- The quality of the EFA measures taken up are poor (there is no incentive to go for the options which deliver more);
- In the context of GBI, connectivity between features is not incentivized at all.

Issues to tackle in future

- The compensation levels don't reward for the benefits provided e.g. farmers in an Environmentally Sensitive Grassland area don't receive higher funding.
- An aim for the future should be to better target the areas for the measures and to connect them e.g. having a national or regional plan of key areas for biodiversity or GBI.
- The conditions attached to the measures, their spatial design, the mix of seeds used, etc. is very important.

Feedback from MS:
Netherlands – there is a national GI strategy with the aim to provide an ecological main structure. This includes maps of target areas. There is no link made to agricultural policy. EFAs are not in any way linked.
Austria has quite an inventive implementation of EFAs using equivalence measures to improve the benefits provided by greening. Although 80% of farmers are exempt from greening (small / livestock), 80% take part in agri-environment (strong tradition of using this measure). The "environmentally friendly farming measure" is the baseline scheme for agri-environment and goes beyond what is required by greening. It includes for example, no pesticide use. Farmers could choose to do greening instead but this would mean they were excluded from higher level agri-environment schemes.

Bulgaria - EFA has no impact. A lot of farmers going into organic scheme because of subsidies received rather than out of conviction.
Germany – the cultural landscape programme includes landscape plans which act as instruments for connecting landscape structures. Agricultural land is excluded from this. Reports of a reduction in the use of N-fixing crops and increase in flower strip measures since plant protection products were banned on EFA as farmers don't know how to grow N-fixing crops without pesticide.
Denmark – use of EFAs as a water protection measure against agricultural polution (protection of Fjords)
Latvia – the main measures used are fallow and N-fixing crops. There is greater potential to to protect water courses – banning ploughing and spraying up to the margin edge. Satellite images mean this can be checked easily now.

Group 2 Implementation on the ground
The questions examined were:

d. What are the most important influencers for farmers' choices regarding greening?
e. Are advisory services available for greening and who provides the advice?
f. How can advisory services contribute to providing GBI including the connectivity of elements?

The most important influencers for farmers greening choices were found to be:

- Farmers associations (rather than advisory services)
- Best fit in the current farming practice
- Quality schemes that link the management process with the product – then the farmers get financial incentives, access to advises and peer-to peer exchanges.
- Financial incentives are the same, no matter which options are chosen (30% if farmers implement the greening). The incentive is therefore clearly to choose the measures that best fit current farming practice.

Do advisory services for greening exist?

- In Denmark there are advisory services for the farmers (organic) for preparation of Nature plans;
- In Finland advisory services exist.

Feedback from MS:
In **Finland** EFA have less impact than before because previously the ecologically set aside was 7% and now the requirement for EFA is 5%. The permanent grassland definition does not suit Finland.
The most popular EFA feature in **Denmark is** catch crops. Crop diversification actually harmed some small farms, which previously implemented crop rotation between farms. Money are mainly given for Natura 2000 areas land and only small funds are available for farmland.
France – some implementation of greening. Might be positive when it comes together with water protection. There is a huge problem with calculation of the payments – for example if the hedges are too long, farmers associations recommend to cut the hedges to receive more subsidies on the farmed land (not EFA). The way of the application and control of the greening is very detrimental and stupid e.g. segregating of the market and the greening. What is needed are farm insurance schemes with environmental prescriptions. The way Switzerland went – payments for everyone, not only for Natura areas. Labels which include biodiversity and pay higher rates (same approach as animal welfare). Swiss scheme succeeded to link the environmental/ nature protection obligation with the product. Intensification of grasslands is a very big issue and the NGO works to change the way of management of the grasslands.

Germany - Many of the EFA were there (existed before) and there is no big impact in implementing greening options.
Portugal - farmers opt for fallow land and nitrogen fixing crops, which means that greening has made very little difference. Nitrogen fixing crops were implemented as part of AE RDP measure before in a more successful/ targeted way.
Sweden – very difficult to change because of the legislation.

Comment on focus group / recommendations for next group
The time was not sufficient to get into a detailed discussion. Both break-out groups ended up discussing similar topics and reporting back information from their member state. Group members had varying levels of policy experience. Potential to focus more on fewer questions with the whole group for the next focus group.

COPA COGECA Working Party on the Environment, 21 November 2017, Brussels

The group was made up of around 20 COPA COGECA member organisations (farmer representatives) from different MS. BIOGEA was allotted a 45 minute slot in the meeting.
Names of the participants (from COPA's participants list): Liisa Pietola, MTK (chair of the working party). Valentin Opfermann, COPA-COGECA**;** Dau Melacca (FNSEA); Fanny Gaultier, BEAF; Cécile Jarosz, COOP de France, Virginie Charrier, COOP de France; Augustinavicius Zilvinas, Lithuanian Farmers Union, Klavius Kaspars, Latvia LOSP ; Eberhard Hartelt, DBV; Eugen Köhlar, DBV, Tanja Bäckman, MTK-SLC-Pellero; Joanna Asumus, MTK-SLC-Pellero; Johannes Maes, Ceja; Jan Olof Sundley, LRF; Katie Jarvis, BAB; Diane Mitchell, NFU, Niels Peter Norring DAFC; Karel Matousek AACZ, Area Padourkova; AKCR; Giacoma Sisinni, CIA; Barbara Di Rollo, CIA, Antonio Dosa, CIA; Julia Sarki, JVG, Timo Leskinon, MTK; Duarti Nira, CAD.
(actively participating in the discussion: representatives from UK, Denmark, Ireland, Austria, Finland).

Focus group
Introduction to the project (see slides) 10 minutes.
Handouts were given to the participants with questions (we asked them to send them back).

Led discussion examining the following topics:
Theme 1 National implementation choices of greening and GBI
Main question: How are the CAP greening measures relevant to GBI and national GI Strategies?
Guiding questions:

g. How do the choices of the MS on greening impact GBI?
h. How does the national GI Strategy (if it exists) include agriculture / CAP measures?
i. What greening / EFA are of greatest importance for GBI?

Theme 2 Implementation of greening measures on the ground
Main question: What are the incentives for farmers for choosing particular greening measures?
Guiding questions:

g. What are the most important influencers for farmers' decisions?
h. Have these changed over time with adaptations to greening?
i. How can advisory services contribute to providing GBI including the connectivity of elements?
j. Is there more opportunity for farmers to work together on greening?

In general, the group members have not been involved in any discussion about Green Infrastructure Strategies nationally or on the European level. They regarded this as a failure of managing authorities to communicate on the issue. They were interested in learning more about what GI means and how it might affect farming practice. The following topics were discussed: Concerns were expressed that GI might add a further type of protected area where farming practices are restricted. In Austria, the implementation of the Natura 2000 network has been difficult and farmers would not be keen to repeat this and to see further restrictions applied to their land in relation with GI. In Ireland, similar terminology (green ways and blue ways) is used to talk about recreational path networks. The process of agreeing these networks has been controversial with land managers.

In England, the GI strategy has not been discussed with farmers. This maybe because they have decided farmers are already implementing it through other measures (following “allotting principles?). Farmers are working together already on a catchment basis which means that they carry out joint activities. Farmers also do a lot on a voluntary basis (outside of the CAP) which will not be picked up on if the funding structure alone is examined.

There was a discussion about the meaning of GI and to what extent farmers already provide GI. Is it available on all agricultural land and does it require a change in practice? How can GI corridors be formed without changing practice? Examining the list of GBI features, the participants said that they are available on many farms. There was a discussion about the extent to which a GI feature could be productive. Could it for example, include bioenergy crops?

Barriers to farmers providing GI were discussed. Links made between the different policies implemented by farmers are weak. Policies are tackled one by one e.g. one day nitrates pollution, the next carbon, the next biodiversity. Synergies are not exploited. One of the causes of this lack of coordination is seen in the policy-making process from the top (i.e. the lack of coordination between the Commission DGs and units and then the reflection of this in national policy).
There are also some barriers in the CAP itself. Natural features are changed by natural conditions (e.g. wetlands growing and shrinking with rainfall). Having to provide exact measurements of the features for EFAs is counterproductive and prevents farmers from registering them in order not to expose themselves to penalties.

In terms of farmer decision-making, farmers are not going to favour activities which create significant barriers to production or interfere with their direct payments. In terms of influencing farmers’ decisions, the following would be important:

- Providing financial incentives going beyond the costs of the action (not just income foregone and additional costs);
- Providing financial incentives for farmers to work together e.g. if many farmers are putting in buffer strips, they should receive a higher rate if they act together to protect a water body;
- Providing advice for free. Where farmers have to pay 100% of the cost of advice, they will continue to focus on receiving advice on areas where they will see a financial return.

In general, the participants were interested in the project Biogea and its outcomes, especially what type of policy recommendation will be produced and how stakeholders will be engaged. The latter has been underlined as key for developing useful guidance on local to European level.

Comment on the meeting
The time was again very short. With the time available, however, the format worked better than having break out groups. The participants were engaged with the topic and had more experience with agricultural policy. They did not have any knowledge of the GI Strategy and it appears that this has not been discussed with farmers in any member state. Another interesting finding was that the

list of GBI features was recognised more as natural features which can be present on a farm but was not immediately connected with greening (though it is essentially a list of the EFA features). This might suggest that farmers have not considered many of the greening elements fully. The fact that farmers' representatives at the meeting could recognise the GI elements we presented as natural features present on farms, but did not relate them to the concept of green infrastructure itself, suggests that at the moment we are not "speaking the same language", that the GI concept is neither widespread no self-explaining and that we could/should take this into account while progressing further down from the EU to the national and local level.