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Report

Environment and climate assessment of Germany's CAP Strategic Plan

Institute for European Environmental Policy



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GLOSSARY

ANC: Areas of natural constraints

BMEL: German Federal Ministry of Food and Agriculture

CAP: Common Agricultural Policy

CH₄: Methane

CO₂: Carbon dioxide

EAFRD: European Agricultural Fund for Rural Development

EAGF: European Agricultural Guarantee Fund

EIP: European Innovation Partnership

EU: European Union

GAEC: Good Agricultural and Environmental Conditions

GHG: Greenhouse gas

HVE: Haute Valeur Environnementale (High Environmental Value)

LSU: Livestock unit

LULUCF: Land Use and Land-Use Change and Forestry

MtCO_{2e}: Million tons of CO₂ equivalent

N₂O: Nitrous oxide

SOC: Soil organic carbon

SOM: Soil organic matter

UAA: Utilised agricultural area

UBA: German Environment Agency

EXECUTIVE SUMMARY

The food system of the European Union (EU) has considerable impacts on the climate and environment. European food systems are responsible for an estimated 30% of the continent's greenhouse gas emissions. Agriculture is also the main pressure on biodiversity (through chemical-synthetic pesticides use, landscape simplification and the loss of habitats), and is a significant contributor to soil degradation and reductions in water quality and availability. The ecological transition of agri-food systems is therefore necessary and urgent.

The EU Common Agricultural Policy (CAP), which supports agricultural production through different instruments ('interventions'), is the main funding opportunity for the transition of the block's agri-food systems. Created 60 years ago, the CAP is one of the oldest policies of the EU, and today receives around 30% of the total EU budget. The latest reform of this policy has introduced a new structure ('delivery model') that came into force in Member States at the start of 2023. It includes a set of ten specific objectives: one cross-cutting on knowledge and innovation, three economic, three social, and—the specific focus of this report—three environmental and climate-related: climate action, the protection of natural resources and the conservation of biodiversity. Member States must submit a National Strategic Plan presenting, among other things: the country's needs for each specific objective, the interventions they plan to implement to address these needs, and the budget allocated to these interventions. This new structure was proposed to: a) shift to a performance- and results-based approach, b) give more flexibility to Member States to adapt CAP support to local conditions and needs, and c) increase CAP's impact in terms of sustainability.

This report is part of a series of assessments of CAP Strategic Plans, in Member States with large agriculture sectors and where the potential for addressing national and EU climate and environmental challenges is high. The assessments cover the Strategic Plans' likely contribution to climate mitigation and adaptation, natural resources, and biodiversity protection, in this case for Germany.

Overall, there is potential in Germany for an ambitious CAP 2023-2027 period with regards to the protection of environmental, biodiversity and climate. However, the current Strategic Plan for 2023 falls short of expectations with vast room for improvement, which need to be used in the years until 2027. The CSP has a particularly strong gap with regards to climate objectives, where first pillar measures hardly contribute to climate change mitigation. The Strategic Plan sets a clear focus on the protection and enhancement of biodiversity, which is positive. Here too, however, the potential low uptake by federal states and low remuneration for farmers could limit the ultimate impact. With regards to the

pressing problems related to surface water, coastal waters and groundwater bodies in Germany, the Strategic Plan only implements the absolute minimum in relation to the enhanced conditionality, whereas the incentives for voluntary interventions remain low, along with missing interventions to reduce nutrient and nitrogen losses.

Member States CAP Strategic Plans can be amended once per year, and according to the coalition agreement of the German government the current architecture will be reviewed around the end of 2023 and adapted if necessary. In addition, the German coalition agreement promises to replace the direct payments by 2027 by rewarding climate and environmental services. The coalition agreement offers a good basis to increase the ambition towards more climate change mitigation and the protection and enhancement of natural resources and biodiversity within the CAP period of 2023-2027. The report proposes two sets of recommendations. The first set focuses on potential amendments to German's Plan in the current period:

- Ensure that there are no further derogations to the enhanced conditionality after 2023. The exemption in 2023 on crop diversification (GAEC 7) and on non-productive areas or features (GAEC 8) must remain an exception.
- Increase width of buffer strips within GAEC 4 to a minimum of 5 metres to achieve a uniform baseline for buffer strips through the regions, including the prohibition of pesticide and fertilizer usage in these buffer strips.
- Increase the allocation of budget to the eco-schemes to the minimum of 25%.
- Introduce eco-schemes to reduce nutrients and nitrogen losses.
- Apply increasing unit amounts per additional percentage for the eco-scheme on non-productive land (DZ-0401), to incentivise farmers to increase their non-productive land to the maximum of 6%, to meet the EU Biodiversity Strategy target of a total of 10% non-productive land.
- Ensure that the federal states are implementing a minimum set of rural development interventions in Pillar II, which are highly beneficial for climate change mitigation and the protection and enhancement of natural resources and biodiversity, taking regional characteristics into consideration. This could be agreed in the upcoming Conference of German Ministers of Agriculture in March 2023, based on a positive list proposed by the Federal Ministry of Food and Agriculture.
- Phase out direct payments on drained peatlands (organic soils), while using eco-schemes and rural development interventions to prepare the long-term

rewetting of peatlands. These measures include the conversion of arable land on organic soils to grassland, the extensification of the use of peatland grassland, and the reduction of livestock in these areas.

- Introduce interventions that support mixed-crop livestock systems, a high on-farm feed production ratio and the reduction of livestock units per hectare at farm level, especially in regions with high livestock density.

The second set focuses on recommendations for the next CAP and for other related policies:

- Introduce environmental and climate ring-fencing for cross-cutting measures, all sectoral interventions and productive investments in the next EU regulation, to ensure a minimal share of the budget will be spend on projects contributing to these objectives.
- Increase the environmental and climate ring-fencing for Pilar II and the minimal budget dedicated to eco-schemes.
- Include measurable integrated pest management criteria into the enhanced conditionality.
- Establish a financing basis for the comprehensive and long-term restructuring of livestock farming in Germany at the national level.

ZUSAMMENFASSUNG

Das Ernährungssystem der Europäischen Union (EU) hat erhebliche Auswirkungen auf das Klima und die Umwelt und ist schätzungsweise für 30% der EU-Treibhausgasemissionen verantwortlich. Dabei trägt es erheblich zur Verschlechterung der Böden und zur Verringerung der Wasserqualität und -verfügbarkeit bei und ist gleichzeitig ein Treiber für den Verlust der biologischen Vielfalt unter anderem durch den Einsatz chemisch-synthetischer Pestizide, die Vereinfachung von Fruchtfolgen und den Verlust von Lebensräumen. Die Transformation hin zu einem nachhaltigen Agrar- und Ernährungssystem ist daher dringend notwendig.

Die Gemeinsame EU-Agrarpolitik (GAP) unterstützt mit verschiedenen Instrumenten („Interventionen“) die landwirtschaftliche Produktion. Hierfür werden etwa 30% des gesamten EU-Haushalts verwendet. Damit ist die GAP der wichtigste Hebel für die Umstellung der Agrar- und Ernährungssysteme in der EU. Mit der jüngsten Reform der GAP wurde eine neue Architektur („New Delivery Model“) eingeführt, die Anfang 2023 in den Mitgliedstaaten in Kraft getreten ist. Es umfasst zehn spezifische Ziele zu den Themen: Wissen und Innovation, Wirtschaft, Soziales sowie Umwelt- und Klimaschutz. Die Mitgliedstaaten müssen einen nationalen Strategieplan vorlegen, in dem unter anderem der Bedarf des Landes für jedes der zehn spezifischen Ziele, die geplanten Maßnahmen zur Erreichung der Ziele und die für diese Maßnahmen vorgesehenen Haushaltsmittel dargelegt werden. Die neue Architektur soll a) zu einem leistungs- und ergebnisorientierten Ansatz führen, b) den Mitgliedstaaten mehr Flexibilität geben, um die GAP-Fördermittel besser an die Bedingungen und Bedürfnisse vor Ort anzupassen, und c) die Wirkung der GAP mit Blick auf Nachhaltigkeitsaspekte zu stärken.

Der hier vorgestellte Bericht fokussiert sich auf den Bereich Umwelt- und Klimaschutz und analysiert den deutschen GAP-Strategieplan im Hinblick auf die drei spezifischen Ziele: Klimaschutz und Klimaanpassungen, Schutz der natürlichen Ressourcen und Biodiversität. Die Analyse ist Teil einer Reihe von Bewertungen von GAP-Strategieplänen in Mitgliedstaaten mit großen landwirtschaftlichen Sektoren.

Grundsätzlich hat der Deutsche Strategieplan das Potenzial für eine ambitionierte Förderperiode von 2023 bis 2027 zum Schutz der Umwelt, der biologischen Vielfalt und des Klimas. Der vorliegende Strategieplan für das Jahr 2023 bleibt jedoch durch die konkrete Ausgestaltung von Maßnahmen deutlich hinter den Erwartungen zurück und bietet viel Raum für Verbesserungen, der in den Jahren bis 2027 gefüllt werden muss. Insbesondere der Klimaschutz kommt in dem Strategieplan zu kurz, unter anderem weil die klimarelevante GAP-Maßnahmen der 1. Säule kein hohes Ambitionsniveau aufweisen. Es ist deutlich erkennbar, dass ein Schwerpunkt des

Strategieplans auf dem Schutz und die Verbesserung der biologischen Vielfalt liegt, was positiv hervorzuheben ist. Jedoch könnte die geringe Umsetzung der Maßnahmen auf Bundeslandebene und die geringe Vergütung für die Landwirte die Wirkung der Biodiversitätsmaßnahmen einschränken. Mit Blick auf die drängenden Probleme bei der Verunreinigung von Oberflächengewässern, Küstengewässern und Grundwasserkörpern durch die Landwirtschaft in Deutschland setzt der Strategieplan nur das absolute Minimum um, während die finanziellen Anreize für freiwillige Maßnahmen über die 2. Säule nicht ausreichend erscheinen. Maßnahmen zur Minimierung von Nährstoff- und Stickstoffverluste sind bisher zu wenig und oft nur indirekt adressiert.

Die GAP-Strategiepläne der Mitgliedstaaten können einmal pro Jahr angepasst werden. Laut dem Koalitionsvertrag der deutschen Regierung soll die derzeitige Architektur gegen Ende 2023 überprüft und im Sinne der Zielerreichung angepasst werden. Darüber hinaus soll ein Konzept vorgelegt werden, wie die Direktzahlungen durch die Honorierung von Klima- und Umweltleistungen angemessen ersetzt werden können. Damit bietet der Koalitionsvertrag eine wesentliche Grundlage, für eine deutliche Anpassung des Strategieplans ab 2024 hin zu mehr Klima-, Biodiversitäts- und Umweltschutz.

Die Politikempfehlungen dieses Berichts konzentrieren sich sowohl auf mögliche Anpassungen des deutschen Strategieplans in der laufenden Förderperiode als auch auf die Weiterentwicklung der GAP nach 2027 sowie angrenzende Politikbereiche.

Empfehlungen für Anpassungen in der laufenden Förderperiode:

- Keine weiteren Ausnahmen der Konditionalität nach 2023. Die Ausnahmeregelung im Jahr 2023 zur Fruchtfolgendiversifizierung (GLÖZ 7) und den Brachen (GLÖZ 8) müssen eine Ausnahme bleiben.*
- Die Breite der Gewässerrandstreifen (GLÖZ 4) sollte auf mindestens 5 Meter ausgeweitet werden, um eine einheitliche Basis für Gewässerrandstreifen in allen Bundesländern zu schaffen, einschließlich des Verbots der Verwendung von chemisch- synthetischen Pestiziden und Düngemitteln auf diesen Flächen.*
- Erhöhung der Mittelzuweisung für die Öko-Regelungen auf mindestens 25%.*
- Programmierung von Ökoregelungen zur Verringerung von Nährstoff- und Stickstoffverlusten.*
- Ansteigende Einheitsbeträge für die Ökoregelung zu einjährigen Brachen (DZ-0401), um Landwirten einen Anreiz zu geben, ihre Brachen auf 6% ihrer landwirtschaftlichen Fläche auszuweiten, um damit das Ziel der EU-Biodiversitätsstrategie von insgesamt 10% Brachflächen zu erreichen.*

- *Sicherstellen, dass die Bundesländer ein Mindestmaß an freiwilligen zweite Säule Maßnahmen anbieten, die für den Klima-, Biodiversitäts- und Umweltschutz von großer Bedeutung sind, wobei die regionalen Besonderheiten zu berücksichtigen sind. Dies könnte zum Beispiel auf der kommenden Agrarministerkonferenz im März 2023 auf der Grundlage einer vom Bundesministerium für Ernährung und Landwirtschaft (BMEL) vorgeschlagenen Positivliste vereinbart werden.*
- *Ein Auslaufen der Direktzahlungen für landwirtschaftliche Produktion auf entwässerten Moorflächen bei gleichzeitiger Nutzung von Ökoregelungen und freiwilligen Maßnahmen der zweiten Säule zur Vorbereitung der langfristigen Wiedervernässung von Moorflächen. Dazu gehört die Umwandlung von Ackerland in Dauergrünland, Extensivgrünland auf Moorflächen und die Reduzierung des Viehbestands auf diesen Flächen.*
- *Einführung von Maßnahmen zur Förderung einer flächengebundenen Nutztierhaltung, betriebseigene Futtermittelproduktion und Maßnahmen zur Begrenzung von Großvieheinheiten pro Hektar auf Betriebsebene, insbesondere in Regionen mit hoher Viehbesatzdichte.*

Empfehlungen für die Weiterentwicklung der GAP nach 2027 und angrenzende Politikbereiche:

- *Einführung eines Mindestbudget für Klima-, Biodiversitäts- und Umweltschutz innerhalb der sektorspezifischen und investiven Maßnahmen.*
- *Mehr Geld für die Grüne Architektur zur Verfügung stellen (1. Und 2. Säule).*
- *Die Aufnahme des integrierten Pflanzenschutzes in die Konditionalität.*
- *Schaffung einer Finanzierungsgrundlage für eine umfassende und langfristige Umstrukturierung der Nutztierhaltung in Deutschland.*

INTRODUCTION

The food system of the European Union (EU) has considerable impacts on the climate and environment. In particular, research shows that the European food system is responsible for 30% of the Union's GHG emissions (Crippa et al. 2021). They are also the main pressure on biodiversity (through pesticides use, landscape simplification and the destruction of habitats), and responsible, to a large extent, for the physical, chemical, and biological degradation of soils and the decrease in water quality and availability. To address these issues, the European Commission developed new strategies in the framework of the European Green Deal: the Farm to Fork Strategy which aims to make food systems fair, healthy and environmentally friendly, and the Biodiversity Strategy which aims to put Europe's biodiversity on the path to recovery by 2030. Both include targets related to agriculture, mainly: 50% reduction of the overall use and risk of chemical pesticides, 25% of the EU's agricultural land under organic farming, 10% of agricultural area under high-diversity landscape features, 50% reduction of nutrient losses, the reduction of fertilizer use by at least 20% by 2030 and the contribution to the 55% greenhouse gas emissions reduction target by 2030 and to climate neutrality by 2050. The Common Agricultural Policy (CAP), which supports agricultural production in the EU through a system of interventions (subsidies) is the main funding opportunity on European level for the achievement of the Farm to Fork targets and the transition of agri-food systems. It is thus crucial to mobilise it to this aim.

Created 60 years ago, the CAP is one of the main policies of the EU, accounting for around 30% of the total EU budget. Historically, it has focused primarily on increasing productivity and competitiveness as well as ensuring food production, fair income for farmers and reasonable prices for consumers. For years, it has mainly supported the intensification of European agriculture, and thus indirectly contributed to its negative impacts on the environment and climate. However, since the end of the twentieth century, environmental and climate aspects have been gradually included. In 2018, the European Commission proposed a new structure for the CAP that started operating in Member States in 2023. This new CAP includes a new set of ten specific objectives, out of which three are related to the environment and climate: climate action (specific objective D), the protection of natural resources (specific objective E), and the conservation of biodiversity (specific objective F). It also relies on a 'new delivery model' where Member states must submit a National Strategic Plan presenting, among other things: the country's needs for each specific objective, the interventions they plan to implement to address these needs and the budget allocation. These plans must be approved by the European Commission to ensure that Member States will contribute to the defined objectives. This new structure was proposed to: a) shift

to a performance- and results-based approach, b) provide more flexibility to Member States to consider local conditions and needs and c) increase the EU's ambitions in terms of sustainability. To assure the objectives are reached, the assessment of the Strategic Plans performance will be based on a set of result indicators.

This report is part of a series of reports aiming to assess the likely contribution to climate change mitigation and adaptation, natural resources, and biodiversity protection of the CAP Strategic Plan of several Member States which play a significant role in the EU agricultural sector. This report analysis the National Strategic Plan of Germany, which is one of the EU's major agricultural producers. With almost 11% of the total EU agricultural area¹, and around 270 000 farms (BMEL, 2020b), Germany produced almost 13% of the total value of EU crop production and more than 16% of the value of EU animal production in 2021 (European Commission, 2021). In 2021, milk, pigs, cereals and vegetables and horticulture production were the most important sectors in terms of production value.

Germany's CAP Strategic Plan was approved by the European Commission on the 21st of November 2021. This assessment focuses on the environment and climate objectives in the Strategic Plan and is structured in five sections. First, it presents the general priorities set up by Germany in its Strategic Plan and the planned allocation of funding, in order to estimate the amount of funding targeting environmental and climate objectives. The three following sections explore the interventions proposed to contribute to climate change mitigation and adaptation (section 2, specific objective D), natural resources protection, in particular water and soil (section 3, objective E) and the conservation and restoration of biodiversity (section 4, objective F). Then, the report presents the transversal interventions that could contribute jointly to these three objectives, i.e., those supporting cooperation, innovation, knowledge exchange and dissemination and advisory services. Finally, the conclusion summarises the results and proposes key recommendations to improve the environmental and climate contribution of the Strategic Plan.

¹ EU Agri-Food Data Portal: <https://agridata.ec.europa.eu/extensions/DataPortal/home.html>

1. GENERAL OVERVIEW OF THE CAP STRATEGIC PLAN'S PRIORITIES: DOES THE MONEY GO TO ENVIRONMENTAL AND CLIMATE ACTION?

In general, CAP funding is divided between two funds, the European Agricultural Guarantee Fund (EAGF, also referred to as Pillar I) and the European Agricultural Fund for Rural Development (EAFRD, also referred to as Pillar II). Historically, the EAGF has focused on funding interventions related to income support, while the EAFRD is used to target rural development as well as environmental and climate objectives. However, interventions focusing on climate and environmental aspects have been gradually integrated in Pillar I since 2014, first through the cross-compliance and 'greening' payment and now through the introduction of the enhanced conditionality and eco-schemes.

The total CAP budget (Pillar I and Pillar II) in Germany for the period of 2023 to 2027 will be about 36 billion euros, out of which around 30 billion euros comes from the EU and 6 billion comes from German co-funding. Of the 6 billion Euro federal co-funding 3.7 billion euros is national and 2.4 billion comes from the federal states for Pillar II (see table 1). In terms of the total budget available, the bulk goes to Lower Saxony, followed by Bavaria, Schleswig-Holstein and Baden-Württemberg. However, in Pillar II most funds are available in Bavaria, Lower Saxony, Baden-Württemberg and North Rhine-Westphalia.

Table 1: Planned budget in millions of euros by the federal states for EAFRD funding between 2023 – 2027 (source: BMEL, 2022)

	EU EAFRD funds	National co-financing	National top ups by federal states	Total
Baden-Württemberg	707	590	202	1,499
Bavaria	1,487	1,139	560	3,186
Brandenburg/Berlin	717	158	0	875
Hesse	357	154	81	592
Mecklenburg-Western Pomerania	653	199	88	940
Lower Saxony/Bremen/Hamburg	1,195	365	1,014	2,574

North Rhine-Westphalia	677	478	16	1,071
Rhineland-Palatinate	337	174	113	624
Saarland	56	35	1	92
Saxony	571	141	0	712
Saxony-Anhalt	594	128	34	756
Schleswig-Holstein	437	110	238	785
Thuringia	453	143	5	601

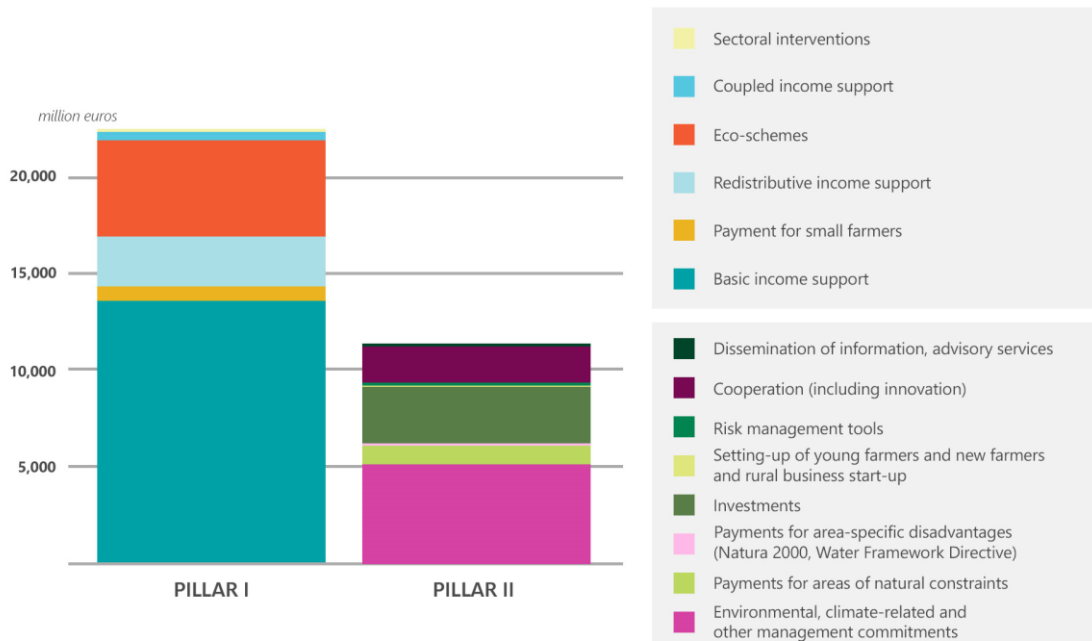
Overall, around 66% of the total CAP funds will be allocated to Pillar I which is below the EU average of around 75% (see chart 1 for the allocation of the CAP budget for Pillar I and II interventions). In addition, Germany will gradually shift 15% of the funds from Pillar 1 to Pillar 2 until 2026. The ministers of agricultural of the federal states have decided that these redeployed funds are to be used by the federal states for sustainable agriculture (BMEL, 2022). This implies that at the end of the funding period in 2027, the EAFRD will be strengthened by around 740 million euros per year, and by a further 3.1 billion euros over the entire funding period.

In order to guarantee a minimum budget for interventions benefiting public goods in all countries, the EU CAP Regulation states that all Member States must dedicate at least 25% of the funding for direct payments to eco-schemes and at least 35% of Pillar II funding to environmental, climate, organic and animal welfare commitments². This is so-called 'ringfencing' of funds. In the case of Pillar II, ringfencing includes the following interventions: environmental, climate and other management commitments (formerly called agri-environmental and climate measures), compensation payments for area-specific disadvantages in relation to the Water Directive Framework and EU nature directives (in particular Natura 2000 areas), investments targeting these objectives, as well as 50% of the payments for areas of natural constraints (hereafter, ANC). Germany allocates around 4.9 billion euros (22% of Pillar 1 payments over the whole five-year period) to the eco-schemes, which is less than the minimum of 25% of direct payments' budget, whereas for Pillar II they exceed the minimum, allocating almost 60%

² <https://eur-lex.europa.eu/eli/reg/2021/2115/oj>, article 93 and 97. However, Members states are allowed, to a certain extent, to decrease their contribution to eco-schemes under certain conditions, for instance in the first years of implementation to fund other interventions, or if the environmental, climate, organic and animal welfare contribution of Pilar II exceeds 30%.

(11.4 billion euros) of Pillar II (including co-financing) to environmental, climate, organic and animal welfare objectives.

Chart 1: Budget allocation to interventions in Pillar I and Pillar II



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Chart 1: German CSP, available [here](#).

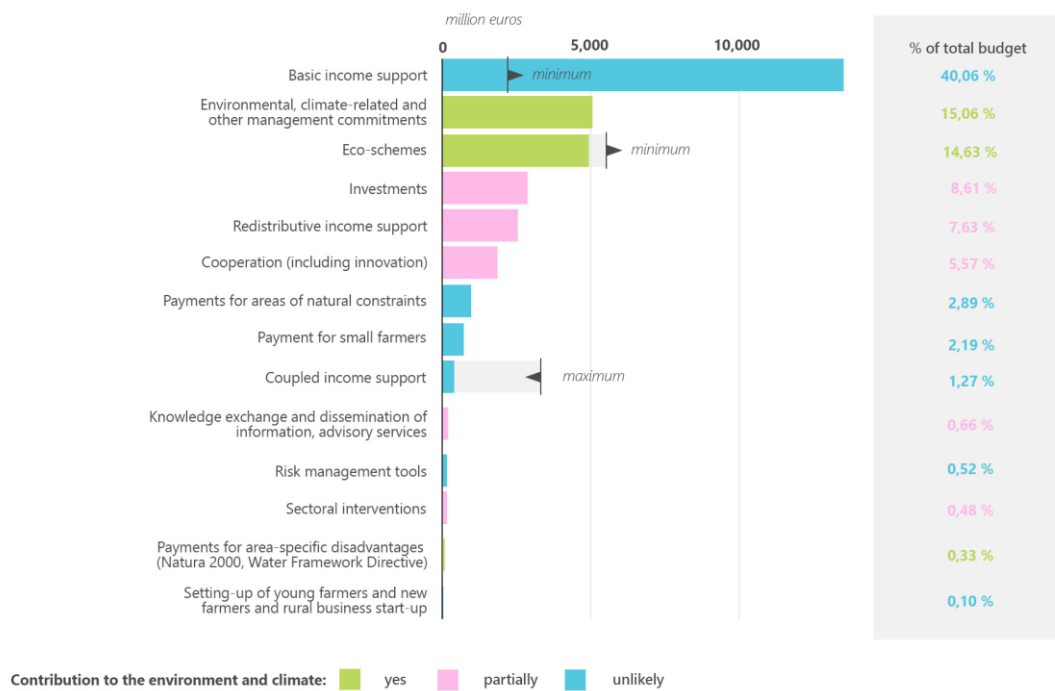
Looking at the detailed allocation of the CAP budget to the different types of interventions (see Chart 2), basic income support, which aims to support farmers' income, remains the most funded instrument, with a budget of 13.5 billion euros (40% of the total CAP budget). However, the basic income support will be gradually reduced over the years from 170 euro/ha in 2021 to 149 euro/ha in 2027 due to the reallocation from Pillar 1 to Pillar II. The remaining Pillar I budget is mainly allocated to the eco-schemes (22%), followed by redistributive income support (12%), young farmers income support (3%), coupled payments (2%) and sectoral interventions (1%). The largest share of the budget for eco-schemes is spent on achieving the biodiversity objective (SO F), followed by promoting sustainable development and the efficient management of natural resources (SO E), and only to a small extent on achieving the climate objectives (SO D) (see Box 1).

From the Pillar II budget 5 billion euros (45%) are allocated to agri-environmental and climate measures, followed by 2.9 billion euros (26% of pillar II budget) for investments and 1,9 billion euros (17% of pillar II budget) for cooperation measures. The budget allocations for the agri-environmental and climate measures confirm that there is a clear focus on biodiversity-promoting measures

(15% of the total budget), with the exception of the intervention on organic farming (20% of the total budget). In comparison, measures aiming at climate change mitigation receive only 1.3% of the total budget and measures for water and soil protection 2% and 2.3% respectively. Within the investment budget almost 60% contribute to climate and environmental objectives such as non-productive water investments, non-productive investments to protect natural resources flood and coastal protection. The other 40% (around 1.1 billion euros) are aimed more at improving the overall economic situation of farmers promoting jobs, economic growth as well as social inclusion and local development in rural areas.

Overall, it is difficult to estimate the budget allocated to each of the environmental and climate specific objectives as each intervention is associated to more than one specific objective.

Chart 2: Budget in millions of Euro allocation to interventions in the German Strategic Plan



While budget allocation provides an indication on the priorities set in the Plan, it does not give information about the effectiveness of the interventions chosen to deliver on environmental and climate objectives. In the next sections, we explore the environmental and climate objectives and discuss the potential contribution and limitations of individual interventions of the German Strategic Plan. The focus will be mainly on interventions contributing to environmental and climate action

(e.g., enhanced conditionality and eco-schemes in Pillar I, environment and climate commitments from Pillar II).

Box 1: Overview of the German eco-schemes

Figure 1: Overview of the German eco-schemes

Eco-schemes	Main focus	Budget in million EUR	Payment per ha
1. Improvement of biodiversity and habitat conservation a) Non-productive land on arable land b) Planting flower strips or areas on arable land c) Planting flower strips or areas in permanent crops d) Old grass strips or areas in permanent grassland	Biodiversity	1.606	200-1.200
2. Diverse crops (minimum of 10% legumes)	Natural resources	598	45
3. Maintaining of Agroforestry	Climate	37	60
4. Extensification of permanent grassland	Natural resources	1.018	100
5. Result-oriented extensive management of permanent grassland	Biodiversity	720	210-240
6. No use of chemical-synthetic pesticides	Natural resources	692	110-130
7. Protection of Natura 2000 sites	Biodiversity	262	40

Figure 1: Authors, based on the Strategic Plan

The German CAP Strategic Plan offers in total seven different eco-schemes with different payment levels. The eco-scheme 1 offers four sub-measures. Farmers can choose between these eco-schemes and combinations are also possible.

Most of the eco-schemes have their focus on the protection of biodiversity and natural resources, with only one eco-scheme directly addressing climate change mitigation and adaptation.

Eco-schemes 1, 4, 5 and 6 have the highest planned budget, also with the view of the payment per hectare. Eco-scheme 1a and 1d offer descending unit amounts. Eco-scheme 1a on "non-productive land on arable land" is remunerated with EUR 1 300/ha for the first percent, EUR 500/ha for the second percent and EUR 400/ha for third to six percent. Eco-scheme 1d on "old grass stripes and areas" is remunerated with EUR 900/ha for the first percent, EUR 300/ha for the second percent and 200/ha for the third to six percent.

The effect of these voluntary support measures is expected to be short term and therefore limited, as the duration of the eco-schemes is one

year, and they must be reapplied for by farmers every year. A multi-year participation in the same measure is not excluded but cannot be guaranteed under the current implementation (Entera, 2021). According to European and national law the eco-schemes can be adjusted any-time. Germany could use this option within this funding period 2023-2027, to make the eco-schemes more ambitious and ring-fence additional funds from the 1st pillar to the eco-schemes.

The short duration of the eco-schemes has both advantages and disadvantages. The short duration is not a good basis for effective climate and biodiversity measures, as many ambitious or efficient climate and biodiversity protection measures can only be implemented over a period of several years. Therefore, the short-term nature of the eco-schemes could be made attractive by increasing level of payments in the following year (Scheffler et al, 2022). On the positive side, the short duration could also incentivize farmers to do their first but difficult step of testing out new environmentally beneficial practices by trial and error.

2. CONTRIBUTION TO CLIMATE CHANGE MITIGATION AND ADAPTATION

2.1 GHG emissions reduction

2.1.1 State of play in Germany and resulting needs

Germany is the biggest emitter of total GHG in the EU and after France the biggest contributor of total GHG emissions from agriculture (EEA n.d). In 2021 German agriculture accounts for a total of around 55 Mt CO₂eq, which is 7% of total German emissions. In 2020, most emissions (54%) in German agriculture stemmed from methane from animal husbandry (enteric fermentation and manure), whereas nitrogen oxide emissions (N₂O) from fertiliser use and manure management accounted for 38 % of total emissions (UBA, 2022a). In addition to this, agricultural use of drained peatlands (arable and grassland) contributes further 37 Mt CO₂eq or 5% of total German annual GHG emissions in 2020. In total, agriculture and net emissions from agricultural use of drained peatlands account for around 13% of total German annual GHG emissions in 2020 (Thünen, 2022b und 2022c). In this section, we focus just on emission reductions from agriculture. Peatlands are considered in section 2.2.

Total greenhouse gas emissions from the agricultural sector decreased by 20.5% between 1990 and 2020, which was mainly due to the decline in livestock numbers after reunification as a result of the reduction of overstocking in eastern Germany and the introduction of the milk quota system (Thünen, 2022a). Between 2006 and 2014, emissions increased again mostly due to increased application of digestates (nitrogen) from biogas production. Emissions have been decreasing since 2014 because of declining animal numbers and the decreasing use of synthetic fertilisers (Thünen, 2022a), while emissions remain high in the European context.

There is a clear need for further reduction of GHG emissions from agriculture in Germany (Freluh-Larsen et al, 2021). The highest reduction potentials are associated with livestock and manure management (enteric fermentation, manure management, efficiency, and fertility improvements) (Thünen, 2022c) including the reduction of livestock numbers in areas with high density of livestock.

2.1.2 Planned interventions

The German Strategic Plan does not prioritize the reduction of GHG emissions. Only a few measures have the objective to reduce emissions from livestock and

fertilization. Wiegmann et al, (2022) have shown that in particular the first pillar measures will hardly contribute to achieving the climate targets.

The reduction of methane and nitrous oxide emissions is not addressed by the **enhanced conditionality** nor the **eco-schemes**, which altogether have a minor focus on climate protection. Two out of seven eco-schemes prohibit the use of fertilisers and thus may reduce nitrous oxide emissions. These eco-schemes are a) Provision of land to improve biodiversity (DZ-0401) and b) Extensification of the entire grassland of a holding (DZ-0404). The latter also limits livestock density and can in addition potentially reduce methane emissions. However, it remains open whether the eco-scheme on the extensification of the entire grassland of a holding actually provides sufficient incentives for the conversion of intensively used grassland or whether this eco-scheme will only be used by farms that already apply extensive farming on their grassland (so-called deadweight effect). The eco-scheme on diverse crops with 10% legumes (DZ-0402) can also contribute to the reduction of fertilisers as legumes fix atmospheric nitrogen and thus reduce the need for further fertilisers. However, since fertilisation is still permitted in this eco-scheme, there is hardly any effect to be expected.

In terms of reducing livestock numbers, the German Strategic Plan offers incentives for the extensification of agriculture land through the **rural development interventions** (second pillar), whereby measures mainly relate to grassland and less to arable land. The intervention extensive grassland management (EI-0101) with the clear objective of contributing to climate protection is only offered by four out of 16 federal states (Baden-Württemberg, Bavaria, Rheinland-Pfalz and Schleswig-Holstein). Livestock-rich regions such as Lower Saxony, North Rhine-Westphalia and Hesse do not offer any measures under this intervention. On the other hand, almost all federal states offer nature conservation-oriented grassland and arable management (EL-0105), which also promotes reduced use or avoidance of nitrogen fertilisers with the aim to protect biodiversity. Innovative technical measures such as precision farming are only promoted to a limited extent in Baden-Württemberg (EL-0102) and through investment funding for new machinery (EL-0403). The extent to which these subsidies will actually be used for the acquisition of precision farming technologies and techniques in the interest of environmental and climate protection remains uncertain.

The reduction of greenhouse gases through the efficient use of energy and fuel and the use of renewable energy is also promoted through one **investment intervention** (second pillar) and two **sectoral interventions** (first pillar). However, the Strategic Plan provides little detail on what exactly is being

promoted and no reduction targets are set. It therefore remains open with which ambitions measures are supported here.

Table 3 in the Annex presents the Strategic Plan interventions that are likely to contribute to the reduction of methane and nitrous oxide emissions and presents the main benefits and limitations.

2.2 Carbon storage

2.2.1 State of play in Germany and resulting needs

Ecosystems store large amounts of carbon. Natural sinks need to both be protected and increased to reach climate targets. Alongside forests, peatland soils are one of the most important terrestrial long-term carbon sinks. Moreover, biomass above ground in the form of landscape features (for example, hedges) and individual trees provides important function as carbon storage and other benefits, such as protection against erosion, habitat for beneficial insects and biodiversity.

Today, the vast majority of peatlands in Germany are drained and about 90% of peatland soils are used for agriculture and forestry (BMEL, 2019). Around 40% of emissions from agriculture and LULUCF combined come from drained and farmed peatlands, although organic soils only account for 7% of the agricultural area (UBA, 2021a).

Peatlands can be managed for climate protection in two ways: (1) by keeping undrained peatlands wet to protect existing carbon stores and sinks and (2) by rewetting and/or restoring previously drained peatlands. The conversion of arable land into wet grassland or paludiculture, the creation of infrastructure for water retention and the setting of minimum water levels or damming targets are effective measures (GMC and DVL, (2020).

In addition to peatland protection, prevention of further losses from mineral soils is very important, since agricultural soils continue losing SOC due to a negative balance of carbon inputs and carbon losses from soils because of simplified crop rotations, intensive tillage and removal of crop residues from the fields (Wiesmeier et al, 2020). Grasslands, permanent soil cover and agroforestry can make a significant contribution in keeping and increase SOC. Between 1991 and 2013, the area of permanent grassland in Germany decreased by 11%. The decline in grassland resulted from the increasing demand for fodder and energy crops from arable farming, which includes the conversion of organic soils into arable land for the same purpose. Since 2013, permanent grassland areas have slightly increased again by about 2%. Nevertheless, grassland remains under strong

pressure due to the high demand for arable fodder, the promotion of the cultivation of energy crops and the abandonment of use (UBA, 2021b). The protection of permanent grassland, the conversion of arable land into grassland, improved crop rotations and agroforestry are therefore of central importance.

2.2.2 Planned interventions

The maintenance or increase of carbon storage in soils is directly addressed through the **enhanced conditionality**. The greatest benefit is expected from the introduction of GAEC 2 on the protection of wetland and peatland, which, for the first time, establishes a nationwide requirement for the management of organic soils in Germany. However, the implementation of the measures is not optimal to reduce GHG emissions, with ploughing on arable soils still being allowed between 0-30 cm and the renewal and deepening of drainages remaining possible with permits. The impact on climate protection can be improved by introducing minimum water levels on these areas, at least from a certain point in the year.

The protection of permanent grassland (GAEC 1) also has high potential for climate change mitigation. GAEC 1 intends to contribute increasingly to the long-term use of arable land as grassland beneficial for maintaining carbon storage, although it does not promote an increase of permanent grassland. Newly created permanent grassland from 2021 onwards can be converted back into arable land without permission. This is contrast to the previous CAP 2014-2022 where arable land that had been used as grassland for 5 years lost its arable status and could no longer be converted back to arable land. In many cases this led to counterproductive emergency breaks by farmers.

Permanent soil cover effectively protects against soil erosion and helps to maintain and increase soil carbon. GAEC 6 on soil cover requires that 80% of the arable land of a holding must be covered during winter, which has the potential to reduce SOC losses and thus maintain carbon storage. Although this requirement has been extended to a much larger area in Germany (previously it had only applied on so called ecological focus areas as part of the greening), the Strategic Plan points out that these requirements are already achieved on 70% of the arable land in Germany. This implies that the targets are only increased by 10%.

Several **eco-schemes** could contribute to maintaining and increasing carbon storage. The eco-scheme on maintaining agroforestry on arable land and permanent grassland (DZ-0403) has the potential of maintaining stored carbon in above-ground biomass and in soils. It is being offered for the first time as part of the CAP interventions in Germany. However, the conservation of agroforestry is targeted on only 1% of the agricultural area and is allocated by far the lowest

funding among the eco-schemes. The eco-scheme on crop diversification can directly contribute to increase soil organic carbon on arable land by promoting the cultivation of legumes (DZ-0402) and the extensification of grasslands with a ban on ploughing (DZ-0404) contribute to the conservation of carbon stocks in soils.

Through their **rural development programs** federal states offer different measures which might contribute to improve or maintain carbon storage on agricultural land. However, several measures have only been implemented in a few federal states and therefore have a limited area coverage and impact. Peatland rewetting and the promotion of paludiculture (EI-0101-03) is only promoted in Lower Saxony, Brandenburg and Mecklenburg-Western Pomerania on small percentage of the used peatland areas. Bavaria and in particular Schleswig-Holstein also have significant peatland areas and do not offer measures via Pillar II, which is a missed opportunity, while the effect of this measure is therefore limited. The conversion of arable land to (permanent) grassland in sensible areas is offered in all federal states with often high payment rates which could incentivize farmers. The maintenance of existing or newly established rows of trees and hedges is only funded in Lower Saxony and North Rhine-Westphalia (EL-0105-05), which again is a missed opportunity to promote landscape features and its potentials on protecting carbon stocks. In addition, farmers can receive support for the establishment of agroforestry systems in all federal states via individual productive investments in agricultural enterprises (EL-0403). Organic farming (EL-0108) also contributes soil organic carbon storage, especially due to use of wide crop rotations and the higher proportion of leguminous crops. Organic agriculture is highly promoted in the strategic plan with about 20% of the total second pillar budget.

Table 4 in the Annex shows the Strategic Plan interventions that are likely to contribute to increase the carbon storage in agriculture, as well as their main benefits and limitations.

2.3 Climate change adaptation

2.3.1 State of play in Germany and resulting needs

Climate change in Germany leads to an increase in droughts, floods and erosion risks due to heavy rainfall and frost damage. Crop damage from diseases and pests due to mild winters must also be increasingly expected. German agriculture has suffered significant yield losses in the past 10 years, especially in 2018, 2019 and 2020 mainly due to extreme droughts (BMEL, 2020a). Extreme weather events can have large regional differences: In 2018, for example, Northern Germany (Saxony-Anhalt, Saxony and parts of Bavaria) was particularly affected with not only arable land but also grassland, which led to feed shortages on livestock farms (UBA, 2022b).

Besides mitigating climate change, agriculture must also adapt to changing climatic conditions. In particular, water retention in the landscape and in soils (e.g., by increasing the water storage capacity of soils through the sequestration of soil organic carbon) must be increased in order to reduce the risk of flooding and increase resilience to droughts. In addition, climate-adapted cultivation systems, improved crop rotations, plant breeding and investments in water-saving irrigation systems should be promoted in arable farming, viticulture, hops, fruit and vegetable growing, while avoiding conflicts with other water uses. Erosion control measures also contribute to improved climate adaptation.

2.3.2 Planned interventions

Climate change adaptation is covered by several interventions. The impact of these measures on adaptation, however, are difficult to assess.

Crop diversification can contribute to adaptation and is promoted via the **enhanced conditionality** and the **eco-schemes**. However, GAEC 7 on crop rotation on arable land can only be considered as a crop diversification rather than a genuine crop rotation, which is a missed opportunity to increase the resilience on a field level.

Several interventions focusing on climate adapted are promoted under **rural development programmes**, in particular improved water retention in the landscape (EL-0101-04), investments in flood protection (EL-0402) and improved water management in the landscape (EL-0401) e.g., development of buffer areas and modernisation of dams. The intervention on investment in irrigation systems (EL-0403) is linked to environmental requirements such as water-saving technology and use of recycled water, beneficial for climate change adaptation.

The **sectoral support** addresses the need to promote the use of resistant seed and planting material (SP-0106), the introduction of new hop varieties (SP-0403) and fungal-resistant vine varieties (SP-0303) with the aim of better adapting to climate impacts.

The sequestration of soil organic carbon in the soil and soil erosion mitigation has positive side-effect on the water storage capacity of the soil and thus also promote the adaptation capacity of the soil to dry periods, which are covered in chapter 2.2 and 3.2.

Table 5 in the Annex presents the Strategic Plan interventions that are likely to contribute to climate change adaptation in agriculture, as well as their main benefits and limitations.

3. CONTRIBUTION TO THE PROTECTION OF NATURAL RESOURCES

3.1 Water quality

3.1.1 State of play in Germany and resulting needs

The most significant impacts of agriculture on water in Germany are eutrophication of water bodies, pollutant inputs, in particular pesticides, and habitat alterations. Diffuse agriculture pollution is the most significant pressure on both surface and groundwater bodies (Freluh-Larsen et al, 2021).

Water bodies in Germany fail good ecological status, and all surface waters fail good chemical status. While 69% of surface water bodies are affected by significant diffuse pollution from agriculture, nitrate levels in surface water are driving the failure of the Water Framework Directive (WFD) in approximately 75% of surface waters, (EEA, n.d.). Nitrogen surpluses are found all across Germany – with the highest surpluses found in areas of intensive arable production in the lowlands of northern Germany as well as regions of intensive livestock production of southern and south-west Germany (Freluh-Larsen et al, 2021). While the total balance per hectare of utilized agricultural land is continuedly decreasing, it is still above the target of 70kg/ha³.

Efforts need to be increased to reduce the pressures on water bodies from nitrogen and phosphorous inputs as well as from pesticide contamination. Key measures involve the increase of resource use efficiency by reducing and improving organic and inorganic fertilization through nutrient planning, precision farming or avoidance of fertilizer use in risk areas. Improved soil and crop management avoid nitrate leaching, soil erosion and pesticide contamination through soil conservation measures (e.g., low or no tillage, mulching), improved grassland management and crop rotations (e.g., by including N-fixing crops) and promoting integrated pest management measures (Freluh-Larsen et al, 2021).

3.1.2 Planned interventions

In view of the pressing problems on the status of surface water and seas and groundwater bodies the Strategic Plan only covers the absolute minimum with regards to the enhanced conditionality, while the incentives for voluntary

³ BMEL, Monthly Statistical Report - <https://www.bmel-statistik.de/landwirtschaft/statistischer-monatsbericht-des-bmel-kapitel-a-landwirtschaft/>

interventions remain low with missing interventions to reduce nutrients and nitrogen losses.

The requirement of 3 meters for buffer strips along watercourses as part of the **enhanced conditionality** (GAEC 4) represents the absolute minimum. In Germany, there are several laws and directives, each of which stipulates different provisions on the buffer strips (Water Resources Act, Fertilizer Regulation, Plant Protection Application Regulation, and various federal state laws). To achieve a uniform baseline for buffer strips in all federal states, a minimum width of 5 meters should be defined including the prohibition of pesticide and fertilizer usage.

The **eco-scheme** on the management of arable or permanent crop areas of the holding without the use of chemical-synthetic plant protection products (DZ-0406) can incentivize conventional farms to minimize or reduce the use of chemical-synthetic pesticides with great benefits for water quality. The eco-scheme offers a low remuneration which carries the risk of low uptake by farmers. At the same time, it is not clear if the eco-scheme can be applied by organic farms and how to avoid double payment through organic farming support measures.

The **rural development** interventions to improve water quality (EL-0102) offer a variety of sub-measures, applied by some federal states, with the sub-measure on precision farming only remunerated in Baden-Württemberg (50EUR/ha), while five federal states do not offer any of the sub-measure to their farmers.

In general, the Nitrates Directive is only partially or indirectly addressed in the needs assessment and in the interventions to ensure the reduction of nutrient losses. According to the assessment of needs, nutrient pollution is of very high priority in Germany and nitrate levels in surface water and groundwaters are also high across Germany. This should be adequately reflected in the CSP through e.g. programming eco-schemes to reduce nutrients and nitrogen losses through improved nutrient planning and improved timing of fertiliser application especially in regions with intensive livestock farming.

Table 6 in the Annex presents the Strategic Plan interventions that are likely to contribute to water quality, as well as their main benefits and limitations.

3.2 Soil quality

3.2.1 State of play in Germany and resulting needs

Healthy soils are essential for many ecosystem services, key for sustainable food provision and climate change mitigation and adaptation. Soil erosion and compaction, in addition to the loss of organic matter and soil biodiversity, pose a particular threat to soil quality.

Climate change increases the occurrence of heavy precipitation and droughts which favour soil erosion by water and wind. In Germany, around 25 million tonnes of soil are eroded by water every year with around 22 million tonnes from arable land and 1.4 million tonnes from vineyards (UBA, 2022c). The risk of soil erosion by water on arable land mainly exists in mountainous regions as well as, for example, in hilly areas with high share of arable land such as in Bavaria. The potential risk of wind erosion exists mainly in the North German lowlands and in the coastal areas of the North Sea and the Baltic Sea (BGR 2013).

Both water and wind erosion are associated with increasing field sizes, the absence of soil cover and intensity of soil management. In addition, cultivation of row crops such as maize, potatoes, hops and beet pose a threat in areas prone to water erosion and, in the case of wind erosion, the increased occurrence of drought due to climate change. Soil compaction is also linked to the intensity of tillage in combination with soil texture.

The risk of soil erosion on arable land can be reduced through measures such as permanent soil cover including intercropping, undersowing and soil conservation practices such as minimum tillage and mulching.

3.2.2 Planned interventions

As part of **the enhanced conditionality**, especially GAEC 5 (Tillage management) and GAEC 6 (Soil cover) contribute to a reduced erosion risk. GAEC 5 determines the minimum practices for minimising erosion based on the erosion risk maps. In Germany, the calculation of classes for water erosion is based on the consideration of three factors: soil erodibility (k-factor), slope (s-factor) and regeneration and surface drainage factor (r-factor). All three factors are mandatory for the federal states beginning of the new funding period, which will significantly increase the area of erosion risk compared to the previous funding period. Nevertheless, the consideration of the length factor (L-factor) would also be crucial, especially in regions with gentle slopes. While not taking the L-factor into account, the erosion risk on gentle slopes is potentially underestimated. Currently the L-factor remains optional for the federal states to include.

The **eco-schemes** are not specifically designed to minimise soil compaction and erosion although some can have positive side-effects. Especially, eco-scheme 2 on diverse crops including 10% legumes (DZ-0402) could contribute to reduced subsoil compaction and enhance soil structure, mainly because some legumes, such as alfalfa, develop deep roots that overcome compacted soil layers and increase soil organic carbon.

As part of the **rural development programmes**, the intervention to improve soil protection (EL-0103) is specifically targeted to improve soil quality. The measure offers several sub-measures supporting the creation of erosion strips, improved crop rotations and the cultivation of (fodder) legumes for soil protection and soil conservation management measures. However, the sub-measures are often only offered in a few federal states (up to four) and have a low area coverage.

Some of the interventions analysed in the previous sections contribute to the improvement of soil quality. Measures that contribute to maintaining and increasing soil organic carbon (e.g., improved grassland management), improve soil structure and reduce the risk of erosion and compaction. In addition, the management of crops without chemical-synthetic pesticides have positive effects on soil biodiversity, which has a decisive influence on soil quality. Measures to promote carbon storage in soils are presented in section 2.2 and those to reduce chemical-synthetic pesticide use and thus soil contamination are presented in section 3.1 on water quality and section 4.2 on protected habitat and species.

Table 7 in the Annex presents the Strategic Plan interventions that are likely to contribute to soil quality, as well as their main benefits and limitations.

4. CONTRIBUTION TO THE PROTECTION OF BIODIVERSITY

4.1 Common species related to agricultural landscapes

4.1.1 State of play in Germany and resulting needs

Common farmland species such as birds, insects and invertebrates are faced with an ongoing decline with agricultural landscapes and practices as one of the main drivers. The population status of farmland birds continues to be of concern, while declining at a higher speed than species inhabiting new habitats (Busch et al, 2020). Especially certain species show particularly worrying trends (e.g., the populations of Grey Partridge (a non-migratory farmland bird) and Northern Lapwing declined by nearly 90% between 1992 and 2016). Formerly common farmland birds are now so rare, that abundance declines also have led to a contraction in their range (Gerlach et al, 2019). The dramatic decline in insect biomass in Germany with agriculture activities as one of the main drivers have been pointed out by several studies recently (Uhler et al, 2021; Seibold et al, 2019; Hallmann et al, 2017).

The EU and Germany have repeatedly committed to halting and restoring biodiversity but have failed to fulfil its commitments. The EU Biodiversity Strategy 2030 commits to preserve and restore ecosystems and biodiversity with the specific target to reach at least 10% of the EU's agricultural area under high-diversity landscape features, which is necessary for maintaining biodiversity on farmland. The CAP Strategic Plan of Germany has a critical role in fulfilling the target of 10% while integrating the EU Biodiversity Strategy as a key strategy.

Effective measures to protect and promote common farmland species in Germany are mainly related to the reduction of pesticides, fertilizers and the promotion of landscape elements. Maintenance and promotion of extensive grassland (meadows and pastures) systems, orchard grasslands and agroforestry systems are key measures in extensive and high nature value farmland. In intensive arable and livestock systems, important practices involve improved crop rotations to break pest and disease cycles and reduce the application of chemical synthetic pesticides, fallow land and flowering strips. Organic farms have a much higher share of grassland and a lower management intensity (e.g., no use of chemical synthetic pesticides) than conventional producers and play a key role for the promotion of biodiversity (Frelih-Larsen et al, 2021).

4.1.2 Planned interventions

Overall, the CAP measures for the protection of common species perform better than on climate change mitigation especially when it comes to the budget⁴. However, the implementation of the measures, the derogation of GAEC 8 and the low uptake by federal states of some rural development measures indicate the low ambition for the protection of common species in agricultural landscapes.

The **enhanced conditionality** needs to ensure that farmers that receiving income payments through the CAP do no significant harm to biodiversity and common species as a minimum standard. Several GAECs have the potential of positive benefits on the protection of biodiversity with unknown impact. GAEC 8 on non-productive areas or landscape features is an important minimum requirement to provide habitats for farmland species. The derogation of GAEC 8 for 2023⁵ is the wrong signal as the protection of common species cannot be postponed.

Six out of seven **eco-schemes** have the potential of positive effects for the protection and enhancement of farmland species. Insufficient financial incentives and low uptake by federal states can hinder the unfolding of their potential.

The eco-scheme to improve biodiversity and habitat conservation (DZ-0401) offers several well financed and potentially effective sub-measures. Among others the sub-measure on non-productive land on arable land, which can be used as a top up for GAEC 8 to go beyond the mandatory non-productive land of 4%. In total, holdings have the opportunity to reach 10% non-productive land meeting the EU target. However, the implementation falls short as the top up works with staggered units amounts which potentially leads to a decreased uptake for every extra percentage of non-productive land. It can be expected that holdings top-up GAEC 8 only with 1-2% of the Eco-scheme because the first two percent offer the biggest remuneration. Ultimately, GAEC 8 and eco-scheme 1 will likely not meet the EU target of 10% non-productive land. Instead, increasing unit amounts could incentivise farmers to increase their non-productive land by 6%.

The result-oriented eco-scheme on extensive management of permanent grassland with at least four regional characteristics (DZ-0405) offers an interesting approach⁶, with potentially moderate effectiveness.

⁴ This was also found by the study from Scheffler et al, 2022 based on the draft CAP strategic plan.

⁵ Regulation on the derogation of GAEC 7 and 8 for 2023 available here: https://www.bmel.de/SharedDocs/Downloads/DE/Glaeserne-Gesetze/Referentenentwuerfe/gap-ausnahmen-verordnung.pdf?__blob=publicationFile&v=3

⁶ The approach itself will be further elaborated in chapter 5.2 on innovative measures.

The CAP strategic plan offers a variety of **rural development** interventions partly well financed to protect and support common farmland species with the biggest challenge of corresponding uptake by the federal states. The main intervention on "Management commitments to improve biodiversity" (EL-0105) offers several sub-measures but not all of them are applied by the federal states (E.g., Lower Saxony offers more than 160 sub-measures while Hesse offers no measure under this intervention).

Table 8 in the Annex presents the Plan interventions that are likely to contribute to the protection of common species related to agricultural landscapes, as well as their main benefits and limitations.

4.2 Protected habitats and species

4.2.1 State of play in Germany and resulting needs

The latest state of nature report for Germany presents an increasingly negative trend in the conservation status of habitat types and species protected by the EU Nature Directives, most notably those associated with agricultural landscapes. In total, 63% of Habitats Directive species and 69% of Habitats Directive habitat types have unfavourable-insufficient or poor conservation status, including in particular habitat types and associated species of grasslands, inland waters, wetlands, and seas and coasts (BfN and BMU, 2020).

At the same time, evaluation reports on the implementation and impacts of the former CAP 2014-2020 in Germany (Schoof et al, 2019a; UBA, 2019) show that the situation has rather deteriorated in that period. Main drivers have been the 1) conversion from grassland to arable land for biogas production, stimulated by the renewable energy policy; 2) intensified fertilisation, more frequent mowing and increased silage maize production to support more intensified dairy production; 3) structural change where remaining farms increase area under cultivation and increase crop cultures instead of grassland use for higher revenues (Schoof et al, 2019 b).

Effective measures to protect and promote protected habitat and species in Germany are mainly related to the reduction of pesticides, fertilizers and the promotion of landscape elements. Maintenance and promotion of extensive grassland (meadows and pastures) systems and orchard grasslands are key measures in extensive and high nature value farmland. In intensive arable and livestock systems, important practices involve improved crop rotations to break pest and disease cycles and reduce the application of chemical synthetic pesticides, fallow land and flowering strips (Frelih-Larsen et al. 2021).

4.2.2 Planned interventions

The conservation of protected habitats and species on agricultural land is partly addressed through the conditionality and voluntary eco-schemes with unknown impact, while the enhancement of protected habitats and species is heavily missed out.

The conservation of protected habitats and species is mainly promoted through **GAEC 9** and the **eco-scheme** on the protection of Natura 2000 sites on agricultural land (DZ-0407) and the management of crops without the use of chemical-synthetic pesticides (DZ-0406). These interventions can be effective for the conservation of protected habitats and species, while the overall effects are difficult to estimate.

The main intervention to improve biodiversity (EL-0105) under the **rural development program** offers several sub-measures with potential benefits for protected habitats and species. However, not all federal states make use of these sub-measures. Worth highlighting are the two sub-measures "result-oriented rewarding of more than four species of wild plant flora" and "Cooperative biodiversity measures" due to their innovative approach. Again, the effectiveness of these measures is difficult to assess. In addition, the conservation of genetic resources (EL-0110) offers potential enhancement of protected species but shows low uptake by the federal states.

Table 9 in the Annex presents the Strategic Plan interventions that are likely to contribute to the protection of vulnerable habitats and species, as well as their main benefits and limitations.

5. CROSS-CUTTING AND INNOVATIVE MEASURES

5.1 Cross-cutting measures

The transversal or cross-cutting measures of the Strategic Plan, such as support for co-operation, knowledge exchange and dissemination and advisory services, also have the potential to contribute to environmental and climate action.

Beside cooperation measures like LEADER and EIP-Agri, the German Strategic Plan provides a **Networks and Cooperation** (EL-0701) measure which aim to support practice-oriented networks and cooperations to increase exchange of knowledge and experience and to strengthen climate-, resource- and environmental-friendly, biodiversity-enhancing agriculture and land use in rural areas. In addition, Germany includes for the first time two cooperation measures as part of the agri-environment-climate measures: one on climate protection (EL-0101-05) and one on biodiversity (EL-0105-07). Both measures aim to support the implementation of sustainable and site-adapted climate protection measures on agricultural land that also contribute to the protection of biodiversity, the improvement of ecosystem services and the conservation of habitats and landscapes. By combining several land managers and accompanying project management, targeted climate protection measures in restricted project areas can be implemented through a cooperative approach and have the potential to contribute to the upgrading of an area as a whole.

Knowledge exchange and dissemination, as well as advisory services, can improve farmers' knowledge and the linkages between climate change mitigation, the protection of natural resources and ecosystems and agriculture. These measures can also provide necessary skills to change farming systems, adopt more sustainable practices and improve farms' resilience. The German Strategic Plan includes actions on advice (EL-0801) with the aim to improve the qualifications of advisory staff to be able to respond in a targeted and result-oriented manner to current and future challenges, including those relating to climate change mitigation and adaptation, environmental protection and nature conservation. Furthermore, a measure on qualification, demonstration and knowledge sharing (EL-0802) has the objective to increase awareness and acceptance of nature and landscape conservation as well as for sustainable management through environmental education, target group-orientated information and demonstration.

5.2 Innovative measures

In the following section environmental and climate interventions are identified which can be considered as innovative, which includes social and technical innovations:

The integration of **agroforestry** into the German CAP strategic plan can be counted as innovative as it is technically demanding in the implementation (Würdig and Skalda, 2020) and due to its potentials for climate change mitigation and benefits for the protection and promotion of biodiversity (Freluh-Larsen et al, 2022). The strategic plan offers two different interventions on agroforestry systems which could complement each other in the optimal case. The agroforestry eco-scheme (DZ-0403) focuses on the maintenance of agroforestry systems on arable and permanent grassland while the creation of new agroforestry systems could be supported through agri-environmental-climate measures (EL-0105-05). Scheffler et al, 2022 project that the eco-scheme on agroforestry could have a soil organic carbon sequestration potential of 0,05 Mio t CO₂e in 2023. However, agroforestry conservation is targeted on only 1% of the UAA and is equipped with a low budget. For the creation of agroforestry systems, it can already be observed that only few federal states are offering this option though agri-environmental-climate interventions.

The Strategic Plan includes two innovative measures due to their **result-oriented approach**. The result-oriented eco-scheme on the extensive management of permanent grassland with at least four regional characteristics (DZ-0405) has the potential for high demand from farmers but low effectivity. The intervention is not completely new, because it existed before as part of agri-environmental-climate measures and according to Scheffler et al, 2022, this measure does not lead to quantifiable GHG savings and therefore is only interesting for the protection and promotion of biodiversity. The sub-measures on result-oriented rewarding of more than four species of wild plant flora (EL-0105) promotes the management of species-rich grasslands.

The promotion of **old grassland strips** as part of the biodiversity eco-scheme (DZ-0401) can be especially beneficial for nature conservation and promotion of biodiversity with co-benefits on climate change mitigation (Scheffler et al, 2022). Old grassland strips are an interesting approach as they offer refuge and food for various animal species (mammals, birds, insects) during mowing and beyond.

The eco-schemes on the extensification of the entire permanent grassland of the holding (DZ-0404) and the management of arable or permanent crop areas of the holding without the use of chemical-synthetic plant protection products (DZ-

0406) can be in its combination considered as a **trial-and-error measures** for farmers that are interested in organic farming in the future.

Two agri-environmental-climate sub-measures fund **cooperative approaches** for climate (EL-0101-5) and biodiversity (EL-0105-07) actions, which can support the cooperation between farmers with the objective of farm overarching climate and biodiversity action.

Germany introduced for the first time a **CAP strategic plan advisory committee** supporting the agricultural ministry on the implementation and development of the CAP strategic plan. The committee consists of economic, social and environmental stakeholders, politicians and administrators and is chaired by the Federal Ministry of food and Agriculture. This advisory committee can play a crucial role in the adaptation of the strategic plan towards a more ambitious CAP strategic plan in the coming years and could be an interesting approach for other Member States. However, common agreements among the members of the committee can be difficult to achieve while it has to be noted that science is not represented in the committee at all, which is a missed opportunity.

6. CONCLUSIONS

The German CAP Strategic Plan has the potential for an ambitious CAP 2023-2027 period with regards to the protection of environmental, biodiversity and climate. However, the current Strategic Plan for 2023 falls short of expectations with vast room for improvements, which need to be used in the years until 2027. The CSP has particularly a strong gap with regards to climate objectives, where first pillar measures hardly contributing to climate change mitigation. The Strategic Plan sets a clear focus on the protection and enhancement of biodiversity, which needs to be positively recognized. Here too, however, the potential low uptake by the federal states and low remuneration for farmers could limit the positive impact on biodiversity. With regards to the pressing problems related to surface water, coastal waters and groundwater bodies in Germany the Strategic Plan only covers the absolute minimum with regards to the enhanced conditionality, whereas the incentives for voluntary interventions remain low with missing interventions to reduce nutrients and nitrogen losses.

The distribution of the budget reveals a similar picture. The largest share of the budget for eco-schemes is spent on achieving the biodiversity objective (SO F), followed by promoting sustainable development and the efficient management of natural resources (SO E), and only to a small extent on achieving the climate objectives (SO D). The budget allocations for the agri-environmental and climate measures confirm that there is a clear focus on biodiversity-promoting measures (15% of the total budget). Germany allocated around 4.9 billion euros (22%) to the eco-schemes, which is less than the minimum of 25% of direct payments' budget, whereas for Pillar II they exceeded the minimum, allocating almost 60% (11.4 billion euros) of Pillar II (including co-financing) to environmental, climate, organic and animal welfare objectives.

Member States CAP Strategic Plans can be amended once per year, and according to the coalition agreement⁷ of the German government the current architecture will be reviewed by the middle of the legislative period⁸ and adapted if necessary. On European level a mid-term review is scheduled for 2026. In addition, the German coalition agreement promises a concept to replace the direct payments by 2027 by rewarding climate and environmental services. This is in line with the next CAP, which will come into force after 2027, with discussions already beginning. The coalition agreement offers a good basis to increase the ambition towards more climate change mitigation and the protection and enhancement of

⁷ The coalition agreement between SPD, Bündnis 90/DIE GRÜNEN and FDP can be found here: https://www.spd.de/fileadmin/Dokumente/Koalitionsvertrag/Koalitionsvertrag_2021-2025.pdf

⁸ This would be end of 2023 or beginning of 2024

natural resources and biodiversity within the CAP period of 2023-2027. We therefore propose two sets of recommendations: 1) amendments to the German Plan in the current period, and 2) wider recommendations for the CAP and EU agri-food policy as a whole:

Recommendations for amending the German Plan:

- Ensure that there are no further derogations to the enhanced conditionality after 2023. The exemption in 2023 on crop diversification (GAEC 7) and on non-productive areas or features (GAEC 8) must remain an exception.
- Increase width of buffer strips within GAEC 4 to a minimum of 5 metres to achieve a uniform baseline for buffer strips through the regions, including the prohibition of pesticide and fertilizer usage in these buffer strips.
- Increase the allocation of budget to the eco-schemes to the minimum of 25%.
- Introduce eco-schemes to reduce nutrients and nitrogen losses.
- Apply increasing unit amounts per additional percentage for the eco-scheme on non-productive land (DZ-0401), to incentivise farmers to increase their non-productive land to the maximum of 6%, to meet the EU Biodiversity Strategy target of a total of 10% non-productive land.
- Ensure that the federal states are implementing a minimum set of rural development interventions in Pillar II, which are highly beneficial for climate change mitigation and the protection and enhancement of natural resources and biodiversity taking regional characteristics into consideration. This could be agreed in the upcoming conference of ministers of agriculture in March 2023, based on a positive list proposed by the Federal Ministry of Food and Agriculture.
- Phase out direct payments on drained peatlands (organic soils), while using eco-schemes and rural development interventions to prepare the long-term rewetting of peatlands. These measures include the conversion of arable land on organic soils to grassland, the extensification of the use of peatland grassland, and the reduction of livestock in these areas.
- Introduce interventions that support mixed-crop livestock systems, a high on farm feed production ratio and the reduction of livestock units per hectare on farm level especially in regions with high livestock density.

Wider recommendations:

- Ensure that there are no further derogations to the enhanced conditionality after 2023. The exemption in 2023 on crop diversification (GAEC 7) and on non-productive areas or features (GAEC 8) must remain an exception.
- Increase width of buffer strips within GAEC 4 to a minimum of 5 metres to achieve a uniform baseline for buffer strips through the regions, including the prohibition of pesticide and fertilizer usage in these buffer strips.
- Increase the allocation of budget to the eco-schemes to the minimum of 25%.
- Introduce eco-schemes to reduce nutrients and nitrogen losses.
- Apply increasing unit amounts per additional percentage for the eco-scheme on non-productive land (DZ-0401), to incentivise farmers to increase their non-productive land to the maximum of 6%, to meet the EU Biodiversity Strategy target of a total of 10% non-productive land.

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ANNEX

Table 2: Budgets of the interventions related to environmental and climate objectives

N°	Title	Pillar	Planned budget (in €, whole period)	Planned budget (% of the Pillar, whole period, total public expenditure)
DZ-0401	Provision of land to improve biodiversity and habitat conservation	P1	1.604.913.092	7%
DZ-0402	Cultivation of diverse crops with at least five main crops in arable cultivation including the cultivation of legumes with a minimum percentage of 10 percent	P1	598.432.789	3%
DZ-0403	Maintaining agroforestry management on arable land and permanent grassland	P1	37.500.000	0,2%
DZ-0404	Extensification of the entire permanent grassland of the holding	P1	1.018.711.880	5%
DZ-0405	Result-oriented extensive management of permanent grassland with at least four regional characteristics	P1	720.680.356	3%
DZ-0406	Management of arable or permanent crop areas of the holding without the use of chemical-synthetic plant protection products	P1	692.472.018	3%
DZ-0407	Application of agricultural practices determined by the protection objectives on agricultural land in Natura 2000 sites	P1	262.402.321	1%
DZ-0501	Coupled income support for the beef and veal sector	P1	214.559.947,30	1%

EL-0101	Management commitments to improve climate protection	P2	148.706.311,88 €	1,3%
EL-0102	Management commitments to improve water quality	P2	222.335.720,60 €	2,0%
EL-0103	Management commitments to improve soil protection	P2	265.551.990,00 €	2,3%
EL-0105	Management commitments to improve biodiversity	P2	1.689.522.464,35 €	14,8%
EL-0107	Management commitments for sustainable forest management	P2	17.000.000,00 €	0,1%
EL-0108	Organic farming	P2	2.373.862.221,32 €	20,8%
EL-0110	Management obligations for the conservation of genetic resources	P2	6.337.107,50 €	0,1%
EL-0111	Income compensation afforestation	P2	4.269.030,00 €	0,04%
EL-0401	Non-productive water investments	P2	234.640.224,00	2,1%
EL-0402	Material infrastructure — flood protection, coastal protection	P2	264.339.693,65	2,3%
EL-0403	Individual productive investments in agricultural enterprises	P2	932.595.026,02	8%
EL-0407	Non-productive investments in the forestry sector	P2	102.899.922,25	0,9%
EL-0408	Non-productive investments to protect natural resources	P2	254.593.808,50	2,2%
EL-0701	Networks and Cooperations	P2	80.055.248,99	0,7%
EL-0702	European Innovation Partnership on Agricultural Productivity and Sustainability (EIP-Agri)	P2	156.228.999,85	1,4%
EL-0801	Advising	P2	152.788.507,70	1,3%
EL-0802	Qualification, demonstration activities and knowledge exchange	P2	68.911.223,60	0,6%

SP-0104	Investment and research	P1	NA	NA
SP-0106	Ecological/biological or integrated production	P1	NA	NA
SP-0202	Building, improving and spreading imperishable knowledge	P1	5.604.546,58	0,03%
SP-0203	Investments to improve production and marketing, occupational health and safety, application of control measures	P1	5.956.458,64	0,05%
SP-0204	Quality and purity tests	P1	1.687.463,00	0,015%
SP-0205	Bee colony propagation/preservation and beekeeping	P1	2.001.825,36	0,018%
SP-0206	Implementation and application of research projects	P1	6.366.320,82	0,06%
SP-0303	Restructuring and conversion of vineyards in the form of one or more of the following measures: Variety conversion, replanting of vineyards, replanting of vineyards, improvement of vineyard management techniques, structures	P1	61.503.064,00	0,54%
SP-0304	Investments in tangible and intangible assets in wine-growing systems, processing facilities, vineyard farm infrastructures and marketing structures and tools	P1	55.866.472,00	0,49%
SP-0401	Advising hop planters on sustainability	P1	NA	NA
SP-0403	Climate change	P1	NA	NA

Source: Public version of the German Plan, available [here](#).

Table 3: Overview of interventions and their potential impact on GHG emissions

Interventions	Sub-interventions	Potential benefits and limitations
Eco-scheme 1: Provision of land to improve biodiversity and habitat conservation		+ : Fertilizer use is restricted
Eco-scheme 4: Extensification of the entire permanent grassland of the holding (DZ-0404)		+ : The extensive management of permanent grassland could lead to the reduction of nitrogen emissions by limiting livestock and fertiliser. - : It remains unclear whether 100 EUR/ha is sufficient to promote extensification of intensively used grassland.
Eco-scheme 2: Growing of diverse crops with at least five main crops in arable crops including the cultivation of legumes with a minimum percentage of 10 percent (DZ-0402)		+ : The specification of at least ten percent legumes also promotes the fixation of air nitrogen and can thus reduce the use of nitrogen fertilisers which contribute to climate protection. - : There are no precise specifications for the reduced use of mineral and organic fertilisers for areas with legumes, so it remains doubtful whether this actually leads to a reduced use of fertilisers.
ENVCLIM 1: Management commitments to improve climate protection (EL-0101)	EL-0101-02: Extensive grassland management	+ : The extensive management of permanent grassland could lead to the reduction of nitrogen emissions by limiting livestock and fertiliser. - : This measure is only offered in four federal states (Baden-Württemberg, Bavaria, Rheinland-Pfalz and Schleswig-Holstein). This means that the particularly livestock-rich regions such as Lower Saxony and North Rhine-Westphalia are not addressed.
	EL-0101-05: Cooperative climate protection measures	+ : This measure aims to support the implementation of sustainable and site-adapted climate protection measures on agricultural land through a cooperative approach by combining several land

		<p>managers and accompanying project management.</p> <p>-: This measure is only offered in two federal states (Rhineland-Palatinate and Brandenburg) and can therefore only have a very limited impact.</p>
ENVCLIM 2: Management commitments to improve water quality (EL-0102)	EL-0102-04: Renunciation/reduction of fertilisation and/or chemical-synthetic plant protection	+: Contribute to the avoidance or reduction of fertilisation.
	EL-0102-05: Extensive management of waters, floodplains and water-sensitive areas	+: Contribute to the avoidance or reduction of fertilisation.
	EL-0102-06: Precision farming - Precision Farming	+: Precision Farming promote plan-orientated fertilization and reduce the use of fertilizer. -: This measure is only offered by Baden-Württemberg.
ENVCLIM 5: Management commitments to improve biodiversity (EL-0105)	EL-0105-01: Nature conservation-oriented grassland management	+: This measure fosters the extensive use of grassland sites with restrictions on e.g the use of nitrogen fertilizer and thus will contribute to the reduction of nitrogen emissions. This measure is offered in all federal states except Hesse.
	EL-0105-02: Nature conservation-oriented grazing	+: Extensive grazing management include restrictions on stocking density and will limit emissions from livestock. -: Hessen ranks fifth in Germany among the states with the most cattle breeding but does not offer any measures for conservation-oriented grazing.
	EL-0105-03: Conservation-oriented arable use	+: The extensive management of arable land promotes the renunciation of fertiliser and thus contribute to the reduction of GHG emissions. This measure is offered in all federal states.
INVEST: Individual productive investments in agricultural	EL-0403-01: Individual productive investments in agricultural enterprises	+: Special emphasis is placed on investments to increase energy efficiency and climate performance of agricultural enterprises. -: However, no targets are set for funding allocation to different types of investments so

enterprises (EI-0403)		that it is not clear whether climate and environmental objective will be supported in an ambitious way.
SECTORAL: Investments in tangible and intangible assets in wine-growing systems, processing facilities, vineyard farm infrastructures and marketing structures and tools (SP-0304)	SP-0304-02: Increasing energy efficiency, saving energy, reducing the impact on the environment.	+: Support for investments related to primary energy savings, improvement of operational energy efficiency and the introduction of sustainable processes in farms. This measure is offered in all major wine-growing regions in Germany.
SECTORAL: Climate change (SP-0403)		+: Support will be given to reduce the climate impact of hop cultivation, in particular emissions, e.g., through reducing the share of fossil fuels and increasing the use of renewable energies.

Table 4: Overview of interventions and their potential impact on carbon storage

Interventions	Sub-interventions	Potential benefits and limitations
GAEC 1: Maintenance of permanent grassland		+: The adapted GAEC 1 regulation is intended to promote the long-term use of arable land as grassland, with positive effects on biodiversity and climate with a maximum decrease of permanent grassland of the total regional area of 4%. The definition of permanent grassland includes plants of the genus <i>Juncus</i> and <i>Carex</i> , which are typical of wet grassland sites and thus support the extensive use of wet grassland. -: However, only if <i>Juncus</i> and <i>Carex</i> are not prevalent (i.e., do not appear on more than 50% of the area). This may limit peatland rewetting, since these plants are often prevalent on wet grasslands. In addition, minor conversions of a

		<p>maximum of 500 square meters in a region per beneficiary per year are permitted without authorisation (Bagatell scheme). This could potentially lead to a decrease of grassland every year under the bagatelle scheme.</p>
GAEC 2 -Protection of wetland and peatland		<p>+: GAEC 2 will for first time set a nationwide requirement for the management of organic soils. Ploughing on permanent grassland in wetlands and moorlands is not allowed.</p> <p>-: Ploughing of agriculture land other than permanent grassland from 0-30cm is still allowed. A reduction of drainage or an increase of water levels is not mentioned. However, good peatland protection requires the introduction of minimum water levels, at least from a certain point in the year. Such minimum requirement is missing. The installation of new drainage or deepening of drainages remains possible. Even though permission must be obtained from the environmental authorities (nature conservation and competent water authority), this seems to be in direct contradiction to the goal of improved protection of wetlands.</p>
GAEC 6 - Soil cover		<p>+: Compared to the previous funding period, a minimum soil cover must now be ensured on all arable land between 15 November and 15 January. Previously, this regulation only applied to designated ecological priority areas until 15 February.</p> <p>-: It is stated that soil cover in winter is already achieved on 70% of the arable land in Germany. This means that ambitions will be increased by only further 10%.</p>
Eco-scheme 2: Growing of diverse crops with at least five main crops in arable crops including the cultivation of legumes with a minimum percentage of 10 percent (DZ-0402)		<p>+: The requirements go beyond GAEC 7 and may have a significant effect on the cultivation of legumes which have a positive impact on SOC. The payment level could provide a very attractive incentive for farmers and be highly accepted.</p> <p>-: Deadweight effects are to be expected. Moreover, because there are no limits on fertiliser use, co-benefits with reduced emissions from fertilisation are missed.</p>

Eco-scheme 3: Maintaining agroforestry farming on arable land and permanent grassland (DZ-0403)		<p>+: The maintenance of agroforest systems will contribute to maintain stored carbon in tree biomass and soils</p> <p>-: However, the promotion of new agroforestry areas is not addressed, which would also have a very large effect on the stored carbon.</p>
Eco-scheme 4: Extensification of the entire permanent grassland of the holding (DZ-0404)		<p>+: This measure includes a ban on ploughing and thus contribute to maintain and increase SOC.</p> <p>-: Exceptions to this ploughing ban may be authorised by the competent authority in cases of force majeure or exceptional circumstances. However, after one year, the extent to which these exceptions are implemented shall be reviewed.</p>
ENVCLIM 1: Management commitments to improve climate protection (EI-0101)	EL-0101-01: Conversion of arable land into grassland/permanent grassland:	<p>+: The permanent conversion of arable land into permanent grassland, especially on wetland sites (which is a focus) will have a huge effect on the stored SOC content and will help to increase SOC.</p>
	EL-0101-03: Peat protection measures:	<p>+: This measure promotes rewetting (including grazing with peatland livestock breeds) and the cultivation of paludiculture and can thus have a major positive impact on SOC.</p> <p>-: This measure is only promoted in Lower Saxony, Brandenburg and Mecklenburg-Western Pomerania on a small part of the used peatland. However, Bavaria, Saxony-Anhalt, Baden-Württemberg and in particular Schleswig-Holstein also have significant peatland areas. The effect of this measure is therefore limited.</p>
ENVCLIM 2: Management commitments to improve water quality (EL-0102)	EL-0102-01: Water protection/surface strips	<p>+: This measure contributes to soil carbon sequestration by establishing grassland strips or permanent grassland on arable land in the immediate surroundings of water bodies.</p> <p>-: This measure is offered in only 5 out of 16 federal states and therefore has a limited potential effect.</p>
	EL-0102-02: Intermediate, autumn and winter greening with catch	<p>+: It is widely known that catch crops, undersowing and winter greening have a positive effect on the SOC content.</p>

	crops and undersowns	-: This measure is only offered in Bavaria and Baden-Württemberg and therefore has a very limited regional scope.
ENVCLIM 5: Management commitments to improve biodiversity (EL-0105)	EL-0105-01: Nature conservation-oriented grassland management	+ : The obligatory maintenance of old grass structures on a certain part of the site contributes to the preservation of the site's SOC. -: Very limited regional scope.
	EL-0105-05: Conservation through adapted use and maintenance of existing or newly created fruit trees, rows of trees, hedges and other landscape structures	+ : In particular, the establishment but also the maintenance of new straw orchards, rows of trees and hedges contributes to increased carbon storage in the biomass. -: Most federal states offer only measures refer to the maintenance of orchards. Maintenance of existing or newly established rows of trees and hedges is only funded in Lower Saxony and North Rhine-Westphalia.
ENVCLIM 8: Organic farming	EL-0108-01: Introduction of organic farming:	+ : Organic farming systems have been shown to have higher soil organic matter content than conventional systems. This measure is offered nationwide.
	EL-0108-02: Maintenance of organic farming	See EL-0108-01
INVEST: Individual productive investments in agricultural enterprises (EL-0403)	EL-0403-01: Individual productive investments in agricultural enterprises	+ : Farmers can receive support for the establishment of agroforestry systems in all federal states -: However, no targets are set for funding allocation to different types of investments so that it is not clear whether climate and environmental objective will be supported in an ambitious way.

Table 5: Overview of interventions and their potential impact on climate change adaptation

Interventions	Sub-interventions	Potential benefits and limitations
GAEC 7: Crop rotation in arable land		<p>+: Growing diverse crops might reduce the risk of diseases and may contribute to build up humus.</p> <p>-: Compared to the published draft beginning of 2022, Germany has decided to promote only crop diversification under GAEC 7 rather than crop rotation. In the first draft, a crop rotation was required on each agricultural parcel on at least 50% of the area of a farm. This means that valuable opportunities to increase the resilience of individual fields are being missed.</p>
Eco-scheme 2: Growing of diverse crops with at least five main crops in arable crops including the cultivation of legumes with a minimum percentage of 10 percent (DZ-0402)		<p>+: Growing diverse crops might reduce the risk of diseases. Legumes increase SOC which increase water retention of soils.</p> <p>-: It is not explicitly mentioned that attention must be paid to e.g., drought-resistant varieties.</p>
ENVCLIM 1: Management commitments to improve climate protection (EI-0101)	EL-0101-04: Water retention in the landscape:	+: Water retention in the landscape on permanent grassland and arable land help to decrease risk of floods.
INVEST: Non-productive water investments (EI-0401)	EL-0401-03: To compensate for the negative consequences of climate change on landscape water balance and water supply:	+: Several measures are promoted to adapt water management on climate change e.g. modernisation and conversion of dams and weirs development of buffer spaces and storage

INVEST: Material infrastructure — flood protection, coastal protection (EI-0402)	Flood (EL-0402-01) and coastal protection (EL-0402-02)	+ : The aim is to improve flood protection and to promote coastal protection projects on tide-affected streams and their tide-influenced tributaries
INVEST: Individual productive investments in agricultural enterprises (EI-0403)	EL-0403-01: Productive investments to modernise agricultural enterprises	+ : Investments to prevent damage caused by natural disasters to adverse weather conditions such as frost protection irrigation, hail protection and heavy rain protection. - : Many different investments are promoted under this measure. It remains unclear to what extent the subsidies actually lead to improved adaptation to damage caused by climate change.
	EL-0403-02: Productive investments by agricultural holdings in irrigation systems (under Article 74 of the CAP-SP Regulation)	+ : Investments in irrigation installations on agricultural holdings include investments leading to a net increase in the irrigated area, the use of recycled water and construction or expansion of storage basins. Only water-saving technology can be promoted during the initial purchase. - : Irrigation should only be seen as an additional method to measures that promote the water retention capacity of the soil.
SECTORAL: Ecological/biological or integrated production (SP-0106)		+ : Use of resistant seed and planting material is promoted.
SECTORAL: Restructuring and conversion of vineyards in the form of one or more of the following measures: Variety conversion, replanting of vineyards, replanting of vineyards, improvement of vineyard management techniques, structures (SP-0303)	SP0303-02: Adaptation to climate change, protection of the environment	+ : Fungal-resistant vine varieties help to reduce the risk of diseases

SECTORAL: Climate change (SP-0403)	NA	+: Introduction of new hop varieties to better adapt to climate change
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Table 6: Overview of interventions and their potential impact on water quality

Interventions	Sub-interventions	Potential benefits and limitations
GAEC 4: Buffer strips along watercourses		<p>+: The minimum width of 3 meters for buffer strips is an improvement with regards to the former CAP legislation, with no minimum requirement.</p> <p>-: In Germany, there are several laws and directives, each of which stipulates different provisions on the buffer strips (Water Resources Act, Fertilizer Regulation, Plant Protection Application Regulation, and various federal state laws). To achieve a uniform baseline for buffer strips, a minimum width of 5 meters should be defined.</p>
Eco-scheme: Management of arable or permanent crop areas of the holding without the use of chemical-synthetic plant protection products (DZ-0406)		<p>+: Incentivize conventional farms to minimize or reduce the use of chemical-synthetic pesticides with great benefits for water courses.</p> <p>-: Relatively low remuneration of 130€/ha which harbours the risk of low uptake.</p> <p>It is not clear if holdings under organic farming can access this eco-scheme. Double funding needs to be avoided.</p>
ENVCLIM: Management commitments to improve water quality (EL-0102)	<ol style="list-style-type: none"> 1. Water protection/surface strips 2. Intermediate, autumn and winter greening with catch crops and undersowns 3. Renunciation/reduction of fertilisation and/or chemical-synthetic plant protection 	<p>+: Intervention offers a variety of sub-measures applied by some federal states. Sub-measure 1 and 7 are offered the most.</p> <p>-: Five federal states do not offer any of the sub-measures to their farmers. Sub-measure 6 (precision farming) is only remunerated in Baden-Württemberg with 50EUR/ha.</p>

	<ol style="list-style-type: none"> 4. Extensive management of waters, floodplains and water-sensitive areas 5. Precision farming 6. Biological or biotechnical plant protection 	
Non-productive water management investments (EL-0401)	<ol style="list-style-type: none"> 1. Promotion to reduce material pressures on water 2. Promotion of near-natural water development 3. To compensate for the negative consequences of climate change on landscape water balance and water supply 	+ : Delivers to several needs identified in the Strategic Plan.

Table 7: Overview of interventions and their potential impact on soil quality

Interventions	Sub-interventions	Potential benefits and limitations
GAEC 5 - Tillage management		<p>+ : Until now, there have been inconsistencies between the calculations in different federal states regarding the factors taken into account in the calculations. The minimum requirement was the consideration of soil erodibility (k-factor) and slope (s-factor). Now, the consideration of "R: Regenerative and surface drainage factor" is also mandatory, which represents an improvement. The area of risk at erosion will increase significantly compared to the previous funding period.</p> <p>- : The length factor (L-factor) can be a decisive factor influencing the risk classification of gentle slopes. Without taking it into account, the erosion risk on such slopes is underestimated. This factor is not obligatory in the federal states, but only optional to be taken into account in the calculation.</p>
GAEC 6: Soil cover		+ : Compared to the previous funding period, a minimum soil cover must now be ensured on all arable land between 15 November and 15 January. Previously, this regulation only

		<p>applied to designated ecological priority areas until 15 February. This means that this regulation now applies to a much larger area.</p> <p>-: It is stated in the CSP that soil cover in winter is already achieved on 70% of the arable land in Germany. This means that ambitions will be increased by only further 10%.</p>
GAEC 7 - Crop rotation on arable land, excluding wet crops		<p>+: Growing diverse crops might contribute to build up humus and increase soil quality.</p> <p>-: Compared to the published draft beginning of 2022, Germany has decided to promote only crop diversification under GAEC 7 rather than crop rotation. In the first draft, a crop rotation was required on each agricultural parcel on at least 50% of the area of a farm. This means that valuable opportunities to increase the resilience of individual fields are being missed.</p>
Eco-scheme: Growing of diverse crops with at least five main crops in arable crops including the cultivation of legumes with a minimum percentage of 10 percent		<p>+: Cultivation of different crops can contribute to improved soil structure and the cultivation of legumes increase SOC. This intervention thus can contribute to increase soil quality, while reducing soil erosion and compaction.</p> <p>-: However, only real crop rotations have a significant effect. This measure only promotes crop diversification on the total area of a holding. It does not ensure that crop rotation takes place on the plot.</p>
ENVCLIM 3: Management commitments to improve soil protection (EL-0103)	1. Installation of erosion protection areas or total farm erosion protection measures (EL-0103-01)	<p>+: This intervention fosters the implementation of erosion protection measures to reduce the annual soil removal risk on erosion-prone arable land.</p> <p>-: Only offered in Bavaria, Mecklenburg-Western Pomerania, North Rhine-Westphalia and Thuringia. However, Baden-Württemberg, Saxony, Rhineland-Palatinate and Hesse also have considerable areas at risk of erosion.</p>
	2. Arable fodder/leguminous cultivation (EL-0103-02)	<p>+: The cultivation of legumes has a positive impact on SOC.</p> <p>-: Is only offered in Baden-Württemberg, Saxony and Brandenburg and therefore has a low area coverage.</p>

	3.Strip-Till process, mulch seed, direct/strip seed, conserving tillage (EL-0103-03)	<p>+: Here soil conservation management measures a funded like strip-till, mulch and direct seeding for e.g., row crops like maize, beetroot, potatoes and sunflowers and mulching process for permanent agricultural crops (e.g., hops, wine and fruit)</p> <p>-: Is only promoted in Baden Württemberg, Bavaria and Mecklemburg-Western Pomerania and therefore has a very low area coverage.</p>
	4.Special crop rotation/multiple crops in arable farming (EL-0103-04)	<p>+: Funding for diverse crop rotations with at least 5 different main fruit species</p> <p>-: Only funded in four federal states. It is not always clear how the measures promoted here differ from Eco-scheme "Growing of diverse crops with at least five main crops". Only for Bavaria can more details be found in the CSP, such as the goal of a humus-building crop rotation.</p>

Table 8: Overview of interventions and their potential impact on common species related to agricultural landscape

Interventions	Sub-interventions	Potential benefits and limitations
GAEC 1: Maintenance of permanent grassland		<p>+: Regulation intends to promote the long-term use of arable land as grassland. Maximum decrease of permanent grassland of the total area of 4%. Definition of permanent grassland includes plants of the genus <i>Juncus</i> and <i>Carex</i>, which are typical of wet grassland sites.</p> <p>-: <i>Juncus</i> and <i>Carex</i> are only allowed if they are not prevalent ((i.e., do not appear on more than 50% of the area). This may limit peatland rewetting, since these plants are often prevalent on wet grasslands.</p>

		Minor conversions of a maximum of 500 square meters in a region per beneficiary per year are permitted without authorisation (Bagatell scheme). This could potentially lead to a decrease of grassland every year under the bagatelle scheme.
GAEC 8: Non-productive areas or landscape features		+ : provides habitats for farmland species; - : use of derogation for the year 2023, exemptions of small farms (<10ha), farms with permanent grassland, leguminous plants and land laying fallow on more than 75% of their UAA
Eco-scheme: Provision of land to improve biodiversity and habitat conservation (DZ-0401)	Non-productive land on arable land	+ : Can be used as a top up for GAEC 8 to go beyond the mandatory non-productive land of 4%. In total, holdings have the opportunity to reach 10% non-productive land. - : Germany will make use of the derogation for GAEC 8 in 2023. The combination between GAEC 8 and Eco-scheme (DZ-0401) is therefore not possible in 2023. The top up works with staggered units amounts which potentially leads to a decreased uptake for every extra percentage of non-productive land. It can be expected that holdings top-up GAEC 8 only with 1-2% of the Eco-scheme because the first two percent offer the biggest remuneration not meeting the EU target of 10% non-productive land.

	Planting flower strips or areas on arable land or Planting flower strips or areas in permanent crops	+: simple and cost-effective eco-scheme
	Old grass strips or areas in permanent grassland	+: More ambitious due to shift from Pillar II to Pillar I.
Eco-scheme: Maintaining agroforestry management on arable land and permanent grassland (DZ-0403)		+: The maintenance of agroforestry systems has significant benefits for climate (GHG sequestration), biodiversity and environment and are promoted throughout all recent EU communications. A negative list excludes certain species of wood from being promoted due to their invasive potential. -: This eco-scheme has the lowest financial resources of all eco-schemes, which sets low incentives and harbours the risk of low uptake by farmers.
Eco-scheme: Extensification of the entire permanent grassland of the holding (DZ-0404)		+: More ambitious due to shift from Pillar II to Pillar I.
Eco-scheme: Result-oriented extensive management of permanent grassland with at least four regional characteristics (DZ-0405)		+: Result-based payments are an innovative approach. -: List of potential regional characteristics is not provided and to be defined by the federal states which harbours the risk of high bureaucracy, lack of control mechanisms and potentially low uptake by farmers. Will likely only be applied by farmers that are eligible already but will not incentivise uptake by additional farmers.

<p>Eco-scheme: Management of arable or permanent crop areas of the holding without the use of chemical-synthetic plant protection products (DZ-0406).</p>		<p>+: Incentivize conventional farms to minimize or reduce the use of chemical-synthetic pesticides with great benefits for biodiversity and potential step-by-step measure towards organic farming. -: Relatively low remuneration of 130€/ha which harbours the risk of low uptake. It is not clear if holdings under organic farming can access this eco-scheme. Double funding needs to be avoided.</p>
<p>Eco-scheme: Application of agricultural practices determined by the protection objectives to agricultural land in Natura 2000 sites (DZ-0407)</p>		<p>+: Goes beyond GAEC 9</p>
<p>Coupled income support for the beef and veal sector (ZMK) (DZ-0501)</p>		<p>+: The grazing of land by suckler cows takes place in particular on ecologically valuable land. These animals — typically summer over pastures — strengthen the diversity of landscapes and the associated plant and animal species. This contributes to the protection of biodiversity. The management of permanent grassland in low-mountain locations also makes an important contribution to keeping the landscape open. -: However, there are no restrictions on the number of animals for which support can be claimed and no restrictions on stocking density are given, which may lead to intensification.</p>

Coupled income support for the sheepmeat and goatmeat sector (ZSZ) (DZ-0502)		+: The grazing of land by sheeps and goats takes place in particular on ecologically valuable land. These animals — typically summer over pastures — strengthen the diversity of landscapes and the associated plant and animal species. Sheep and goat farming in Germany provides important social services in coastal and nature conservation and in fulfilling FFH obligations.
ENVCLIM: Management commitments to improve climate protection (EI-0101)	<ol style="list-style-type: none"> 1. Conversion of arable land into grassland/permanent grassland 2. Extensive grassland management 3. Peat protection measures: 	+: Includes 3 sub-measures with biodiversity co-benefits -: Only 9 out of 13 federal states apply this measure
ENVCLIM: Management commitments to improve biodiversity (EL-0105)	<ol style="list-style-type: none"> 1. Nature conservation-oriented grassland management 2. Nature conservation-oriented grazing 3. Conservation-oriented arable use 4. Results-oriented rewarding of more than four species of wild plant flora 5. Conservation through adapted use and maintenance of existing or newly created fruit trees, rows of trees, hedges and other landscape structures 6. Extensive and/or difficult management of permanent crops (vineyard and commercial fruit plants) 7. Cooperative Biodiversity Measures 	+: This intervention integrates seven different measures to support biodiversity. The sub-measures have varying budgets and depend on the federal state to be implemented. E.g., Lower Saxony offers more than 160 measures while Hesse offers no measure.
ENVCLIM: Introduction and maintenance of organic farming (EL-0108)		+: is offered in all federal states. It includes arable land, grassland, horticulture, permanent or nursery crops

		<p>and compensation of transaction cost. Intervention receives the highest share of budget.</p> <p>-: Planned budget and planned output will not be able to reach the target of 30% organic farming by 2030.</p>
ANC: Compensation allowance for less-favoured areas (EL-0201)		<p>+: In particular, grassland and orchards are dependent on regular management. Agricultural production in areas with natural/specific location disadvantages is important for the rural structure and thus the cultural landscape. It also contributes to the restoration, conservation and improvement of biodiversity, including in areas which are disadvantaged for natural or other specific reasons.</p>

Table 9: Overview of interventions and their potential impact on protected habitats and species

Interventions	Sub-interventions	Potential benefits and limitations
GAEC 9: Ban on converting or ploughing permanent grassland in Natura 2000 sites		+: New GAEC but comparable with Greening-ESPG from previous CAP with increase in ambition
Eco-scheme: Management of arable or permanent crop areas of the holding without the use of chemical-synthetic plant protection products (DZ-0406).		+: Incentivize conventional farms to minimize or reduce the use of chemical-synthetic pesticides with great benefits for biodiversity.

		<p>-: Relatively low remuneration of 130€/ha which harbours the risk of low uptake. It is not clear if holdings under organic farming can access this eco-scheme. Double funding needs to be avoided.</p>
Eco-scheme: Application of agricultural practices determined by the protection objectives to agricultural land in Natura 2000 sites (DZ-0407)		<p>+: Goes beyond GAEC 9</p>
ENVCLIM: Management commitments to improve biodiversity (EL-0105)	<ol style="list-style-type: none"> 1. Nature conservation-oriented grassland management 2. Nature conservation-oriented grazing 3. Conservation-oriented arable use 4. Results-oriented rewarding of more than four species of wild plant flora 5. Conservation through adapted use and maintenance of existing or newly created fruit trees, rows of trees, hedges and other landscape structures 6. Extensive and/or difficult management of permanent crops (vineyard and commercial fruit plants) 7. Cooperative Biodiversity Measures 	<p>+: This intervention integrates seven different measures to support biodiversity. The sub-measures have varying budgets and depend on the federal state to be implemented. E.g., Lower Saxony offers more than 160 measures while Hesse offers no measure.</p>
ENVCLIM: Management commitments for the conservation of genetic resources (EL-0110)	<ol style="list-style-type: none"> 1. Conservation of the diversity of animal genetic resources in agriculture 2. Preserving the diversity of plant genetic resources 	<p>+: Breeding or cultivation of endangered species -: low uptake by federal states</p>



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