Core Environmental Standards for UK imported Agri Food Products: Options for Pesticide and Fertiliser Use

A study commissioned by WWF UK

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Institute for European Environmental Policy

Core Environmental Standards for UK imported Agri Food Products: Options for Pesticide and Fertiliser Use

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The World Wide Fund for Nature – UK (WWF UK)

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The contents of this study are not intended to serve as legal advice.

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Abbreviations

CAP	Common Agricultural Policy
CBAM	Carbon Border Adjustment Mechanism
CCC	Committee on Climate Change
CES	Core Environmental Standards
CETA	Comprehensive Economic and Trade Agreement
CO2	Carbon dioxide
CO2eq	Carbon dioxide equivalent
COGAP	Code of Good Agricultural Practice
CXL	Codex Maximum Residue Level
DEFRA	Department for Environment, Food and Rural Affairs
EC	European Commission
EFSA	European Food Safety Authority
EIA	Environmental Impact Assessment
ELMS	Environmental Land Management Scheme
EMEP	European Monitoring and Evaluation Programme
ETS	Emissions Trading Scheme
EU	European Union
FAO	Food and Agriculture Organisation of the United Nations
FERA	Food and Environment Research Agency
FRC	Forest Risk Commodities
FTA	Free Trade Agreement
GAEC	Good Agricultural and Environmental Conditions
GAP	Good Agricultural Practices
GATT	General Agreement on Tariffs and Trade 1994
GHG	Greenhouse Gas

IFM	Integrated Farm Management
ILUC	Indirect Land Use Change
IPM	Integrated Pest Management
K	Potassium
Kg/ha	Kilogram per hectare
LEAF	Linking Environment and Farming
LOQ	Limit of Quantification
LULUCF	Land Use, Land Use Change and Forestry
MMPA	Marine Mammal Protection Act
MRL	Maximum Residue Level
Mt	Megatonne
N	Nitrogen
N_2	Nitrogen gas (unreactive nitrogen)
N_2O	Nitrous Oxide
NH_3	Ammonia
NO_x	Nitrogen oxide
NAP	National Action Plan
NPR PPM	Non-product-related product and process method
NVZ	Nitrate Vulnerable Zone
OECD	Organization for Economic Co-operation and Development
OIE	World Organisation for Animal Health
P	Phosphorus
POPs	Persistent Organic Pollutants
PPM	Product and Process Method
PPP	Plant Protection Products
PUS	Pesticide Usage Surveys
RTA	Regional Trade Agreement
SMR	Statutory Management Requirements
SPS	Sanitary and Phytosanitary

SPS Agreement	Agreement on the Application of Sanitary and Phytosanitary Measures
STDF	Standard and Trade Development Facility
SUD	Sustainable Use of Pesticides Directive
TAC	Trade and Agriculture Committee
TBT	Technical Barriers to Trade
TBT Agreement	Agreement on Technical Barriers to Trade
UK	United Kingdom
UN	United Nations
UNEA	United Nations Environment Assembly
UNEA-4	United Nations Environment Assembly Fourth Session
UNEP	United Nations Environment Programme
UNIDO	United Nations Industrial Development Organization
US	United States
VSS	Voluntary Sustainability Standards
WFD	Water Framework Directive
WTO	World Trade Organization
WWF	World Wildlife Fund

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List of WTO Dispute Settlement Reports

EC – Asbestos	Appellate Body Report, *European Communities – Measures Affecting Asbestos and Asbestos-Containing Products*, WT/DS135/AB/R, adopted 5 April 2001, DSR 2001:VII, p. 3243
EC – Seal Products	Appellate Body Reports, European Communities – Measures Prohibiting the Importation and Marketing of Seal Products, WT/DS400/AB/R / WT/DS401/AB/R, adopted 18 June 2014
EC – Seal Products	Panel Reports, *European Communities – Measures Prohibiting the Importation and Marketing of Seal Products*, WT/DS400/R and Add.1 / WT/DS401/R and Add.1, adopted 18 June 2014, as modified by Appellate Body Reports WT/DS400/AB/R / WT/DS401/AB/R, DSR 2014:II, p. 365
Japan – Alcoholic Beverages II	Appellate Body Report, *Japan – Taxes on Alcoholic Beverages*, WT/DS8/AB/R, WT/DS10/AB/R, WT/DS11/AB/R, adopted 1 November 1996, DSR 1996:I, p. 97
US – Clove Cigarettes	Appellate Body Report, *United States – Measures Affecting the Production and Sale of Clove Cigarettes*, WT/DS406/AB/R, adopted 24 April 2012, DSR 2012:XI, p. 5751
US – COOL	Appellate Body Reports, *United States – Certain Country of Origin Labelling (COOL) Requirements*, WT/DS384/AB/R / WT/DS386/AB/R, adopted 23 July 2012, DSR 2012:V, p. 2449
US – Gasoline	Panel Report, *United States – Standards for Reformulated and Conventional Gasoline*, WT/DS2/R, adopted 20 May 1996, as modified by Appellate Body Report WT/DS2/AB/R, DSR 1996:I, p. 29
US – Shrimp	Appellate Body Report, *United States – Import Prohibition of Certain Shrimp and Shrimp Products*, WT/DS58/AB/R, adopted 6 November 1998, DSR 1998:VII, p. 2755
US – Shrimp	Panel Report, *United States – Import Prohibition of Certain Shrimp and Shrimp Products*, WT/DS58/R and Corr.1, adopted 6 November 1998, as modified by Appellate Body Report WT/DS58/AB/R, DSR 1998:VII, p. 2821
US – Tuna II (Mexico)	Appellate Body Report, United States – Measures Concerning the Importation, Marketing and Sale of Tuna and Tuna Products, WT/DS381/AB/R, adopted 13 June 2012, DSR 2012:IV, p. 1837

US – Tuna II (Mexico)	Panel Report, *United States – Measures Concerning the Importation, Marketing and Sale of Tuna and Tuna Products*, WT/DS381/R, adopted 13 June 2012, as modified by Appellate Body Report WT/DS381/AB/R, DSR 2012:IV, p. 2013

Executive Summary

Introduction

In the post-Brexit era, the United Kingdom (UK) finds itself at a critical juncture as it asserts its position as a global climate leader, rethinking and reshaping its environmental, agricultural, trade and food policies. Domestically, the transition from the European Union (EU)'s Common Agricultural Policy (CAP) to a new policy centred around environmental land management is creating new opportunities for the UK to rethink environmental standards applicable to food and agriculture. At the international level, the UK is now an independent trading nation before the World Trade Organization (WTO) and is, in parallel, negotiating regional trade agreements (RTAs) with key trading partners, several of which are significant agricultural exporters.

A key issue that has received a great deal of attention during these political developments concerns trade and environmental standards in agriculture. Currently, UK farmers must comply with a large number of mandatory environmental requirements set out in UK law. However, these requirements are not imposed on relevant agri-food products imported into the UK.

This situation is unsatisfactory. The UK imports nearly 50% of the agri-food it consumes. The fact that there is no system in place to regulate the environmental performance of almost half of the UK's agricultural consumption means that the UK has an undesirably large external environmental footprint – despite the stringent environmental regulations to which UK farmers are subject. At the same time, if the share of agricultural imports expands, environmental leakage1 may increase, resulting in the further externalisation of the environmental impact of consumption in the UK to third countries. The uneven playing field that emerges from importing agri-food products that are not subject to environmental standards similar or comparable to those applied in the UK also risks worsening the UK's environmental footprint, if the implementation of more stringent environmental requirements leads UK producers to become less competitive vis-à-vis foreign producers not subject to the same or comparable standards. In the long term, the competitive pressures experienced by the agri-food industry may lead to pressures on policymakers to 'level down' the playing field, increasing the domestic environmental costs of agricultural production.

Acknowledging these challenges, a number of advisory bodies in the UK, including the Trade and Agriculture Committee (TAC), have emphasised the importance of exploring the development of core environmental standards (CES), that is, mandatory environmental requirements set out in UK law that would be applicable to all relevant agri-food products imported into the UK. To be clear, the proposed measure does not seek to redesign existing UK environmental regulation. Instead, it seeks to expand the scope of existing environmental

[1] Environmental leakage occurs when partial regulation results in an increase in environmental pressure in unregulated parts of the economy.

regulation to apply not only to UK farmers, but also to relevant imported agri-food products. As is currently the case for UK food safety standards, failure to comply with these environmental requirements would mean that the agri-food product at issue could not enter the UK market. It is also important to highlight that the development of CES is not affected by the stage of implementation of UK trade deals. Indeed, as a policy measure enshrined in UK law, CES would apply to importers across the board, irrespective of the ratification of a free trade agreement (FTA) between the trading partners.

While the idea of developing CES is gaining traction among relevant stakeholders, questions remain about whether, and how, CES can be designed and implemented. For instance, which environmental issues should be addressed first? Can UK environmental requirements simply be imposed on imported food products, or will they have to be redesigned to reflect conditions in exporting countries? How can this be done in a WTO-compliant manner? How can developing countries' needs and concerns be taken into account? How can such a measure be implemented in a manner that is feasible for regulators, custom officials, producers and retailers alike?

A technical analysis has been produced to shed light on these and similar questions. This report contains a summary of the technical report, highlighting main findings of relevance to policymakers. Specifically, the research and analysis undertaken sets out what needs to be done to develop CES in the UK – both on the scientific and the legal side. These findings are based on a proposed methodology, and the application of this methodology to develop CES for curtailing neonicotinoids and nitrogen (N) use. It further discusses how the proposed methodological approach for CES can be applied to environmental issues not included in this study. While this report focuses exclusively on environmental standards, many of the considerations also apply and are relevant to animal welfare standards.

Methodological Framework to Developing Core Environmental Standards

The development of CES for agri-food products is a comprehensive process that should follow the general principles of good policymaking, from the initial issue identification, agenda-setting, stakeholder consultations, assessment of trade-offs and setting of priorities, to evaluating scientific evidence and, finally, developing an effective implementation, policy review and monitoring and evaluation process.

While CES might be a highly effective policy instrument in addressing some issues, it might not be the preferred instrument for others. It is, therefore, important to identify priority areas for applying CES, based upon where CES may be needed most and where it can be most effective. To identify priorities for applying CES, this study has developed two criteria: (i) the CES should address a highly relevant, global environmental issue; and (ii) the CES should focus on issues that are particularly exposed to trade, i.e. where an important regulatory divergence can be observed with regards to domestic and imported agricultural goods.

For cases satisfying these criteria, the development of CES should ensure alignment with relevant international legal principles. Implementing CES will require an inclusive, fair and gradual implementation process, and special care should be taken to ensure the CES take account of the special circumstances of developing country exporters. The table below summarises the key considerations that should be taken into consideration in the development of CES.

Methodological considerations for developing CES

Prioritisation, design and implementation of CES	
Process	Considerations
Identify areas where CES are needed most	• <u>Criterion 1</u>: The CES should address a highly relevant, global environmental issue. • <u>Criterion 2</u>: The CES should focus on areas with important regulatory divergence that can be demonstrated between domestic and traded products.
Design and implementation of CES	
General design-related considerations	• The structure/design of the UK regulation (e.g. quantitative versus qualitative) and trading partners. • The distribution of risk. Is the environmental risk/problem evenly spread across all countries or concentrated in some areas? If concentrated, ensure the CES are designed to consider different risk profiles of countries. • Take into account applicable exemptions to UK producers. • Ensure flexibility to take into account conditions in exporting countries.
Metrics and indicators	• Identify internationally recognised indicators and metrics for the environmental issue/monitoring of required response measures, build on existing certification & metrics.
Monitoring and enforcement of the measure	Four enforcement levels can be considered and/or combined: • At the operation/trader level through due diligence. • At the importer's border through customs control. • Through a third-party verification system. • By the exporter country.
Reflecting relevant international trade law considerations[2]	To be aligned with the UK's commitments under international law, the CES should be designed in line with the principles of the WTO: • **Non-discrimination:** When products are considered to be "like", the CES cannot unjustifiably or arbitrarily discriminate between its trading partners, or between its own and foreign products.

[2] The principles set out in this summary are distilled from the provisions of the General Agreement on Tariffs and Trade 1994 (GATT), the Agreement on Technical Barriers to Trade (TBT Agreement) and the Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement). They combine elements that establish violations of GATT/TBT/SPS provisions, such as non-discrimination, with elements that must be present in order to justify such discrimination under GATT Article XX. Please note that the purpose of this section is to gain an understanding of the legal considerations that must be taken into account when designing CES, not to provide a provision-by-provision legal analysis.

	• **Legitimate regulatory objective:** The CES should be designed to achieve a legitimate regulatory objective. • **Extraterritoriality:** There must be a "sufficient nexus" between the legitimate regulatory objective the CES seeks to advance and the UK. • **Even-handedness:** The CES should consider flexibility to allow for different conditions and characteristics in the exporting countries. • **Trade-restrictiveness**: The CES should not be more restrictive than necessary to achieve the regulatory objective at the level of risk-protection that is chosen by the importing country. • **Sufficient scientific evidence**: It will be difficult to justify the CES if they are not based on sufficient scientific evidence. • **Relevant international standards**: The TBT and SPS Agreements put a premium on complying with the relevant international standard. This will be less relevant for the CES analysis, given the lack internationally accepted CES for agri-food products.
Adopt an inclusive and fair design and implementation process	The CES must be designed in an inclusive, consultative manner considering country-specific considerations, in particular as concerns the needs of developing and least-developed countries. This can be done by considering the following: • Building in exception provisions. • Providing technical and financial support for developing countries to implement required measures. • Providing appropriate transition times between adoption and CES enforcement. • Soliciting feedback from and consulting stakeholders and trading partners starting in the design phase.

CES case studies

Having established key criteria to be applied and elements to take into consideration in the development of CES, this section seeks to apply the methodology introduced above. Specifically, this report examines two case studies. The first case study focuses on the application of CES to regulate the application of neonicotinoid insecticides, three of which are no longer approved for outdoor use in the UK because of their negative impacts on bee populations. The second case study analyses the design of CES to address environmental problems associated with excessive nitrogen use in agriculture. These two case studies were selected from an initial list of five case studies, *inter alia*, on the basis of their global relevance from an environmental perspective.

For both case studies, this report follows the following structure: first, it demonstrates the globally relevant environmental harm that the CES seek to address; the existing laws and regulations in the UK and, where available, in the most relevant exporting countries; the trade implications that arise from CES; and the different policy design options. Following this, for each CES design option, a legal analysis is undertaken to evaluate its WTO-compatibility. In this policy-oriented report, only the principal findings are presented. For the complete details of the case study, readers are referred to the main technical report.

Case Study 1: Neonicotinoids

The case for CES for neonicotinoids

Neonicotinoids (sometimes shortened to "neonics" or NNIs) a are a class of systemic insecticides that have been widely used in the UK since the 1990s to deal with sap-sucking insect pests on cereals, oilseed rape and sugar beet. In 2013, the use of three neonicotinoids (clothianidin, imidacloprid and thiamethoxam) was prohibited for outdoor use based on the scientific evidence of their negative impact on bees. Subsequently, following the restrictions on the use of neonicotinoids, manufacturers withdrew their applications to renew the approval of these pesticides in the EU. Since their initial approval periods expired, these pesticides are no longer included in the EU's list of approved active substances and, by extension, the UK. These three neonicotinoids are thus not only prohibited for outdoor use but are no longer approved for use in the EU and the UK more generally.

The prohibition (or technically more correct, "non-approval") of these neonicotinoids substances is reflected in Maximum Residue Limits (MRLs), which, for non-approved substances, are set at the minimal Level of Quantification (LOQ). However, the low MRLs for these prohibited substances do not necessarily apply to imported products, as traders have been granted import tolerance requests for higher MRLs. The regulatory divergence for neonicotinoids is primarily evidenced by their non-approval in the UK (and EU), on the one hand, and their availability in most exporting countries on the other, as well as by the lower MRLs applied to domestic products compared to higher limits for some imported products. In addition to these elements, the divergence in the regulatory requirements may also concern national regulatory requirements for storing, utilizing and recording the use of pesticides. In the UK, farmers are subject to demanding requirements on these aspects, as well as related aspects, such as user qualifications, maintenance of equipment and disposal of containers, which are subject to both mandatory requirements and the widely used Red Tractor industry certification system, each with their own inspection systems.

This regulatory divergence is environmentally significant because cereals, oilseeds and sugar are imported by the UK in considerable quantities from regions where neonicotinoids are still in use, hence potentially resulting in a higher negative environmental footprint through traded products than would be the case for corresponding domestic production. To the extent that the discontinuation of neonicotinoids in the UK results in reduced crop yields or higher costs of production (e.g. if substitute crop protection methods or products are less effective or more expensive), any increase in the import of goods from countries where neonicotinoids are still permitted would correspondingly increase the environmental damage in those countries. A further consequence of reduced competitiveness of domestic production could be lobbying for a changed approach to pesticide approvals with the risk of undermining domestic environmental regulation.[3]

The neonicotinoid case study shows that a clear regulatory divergence exists between the UK and some of its agricultural trading partners. This provides reason for concern that the trade in affected agri-food products negatively affects a globally relevant environmental public good, namely, the environmental biodiversity. To ensure that the national regulatory objective is not circumvented, there is a case to be made to level the playing field and ensure that both imported and domestically produced agri-products are subject to the same regulatory standards, i.e. restrictions on the outdoor use of neonicotinoids.

Designing CES for neonicotinoids: Options and legal considerations

- Option (A): the *stringent quantitative approach* would require imported products to meet the exact same requirements as UK producers. Specifically, this would mean that importers would not be granted higher import tolerances with respect to the three non-approved neonicotinoids substances. The objective of this option is to level the playing field between domestic and imported products.
- Option (B): the *flexible quantitative approach* would require that environmental considerations are taken into account in the evaluation of requests for import tolerances by trading partners; in other words, trading partners can seek higher import tolerances for neonics, but only if they can demonstrate that the use of the UK non-approved neonicotinoids posed no environmental threat to bees where these substances were used and applied by the trading partner.
- Option (C): the *qualitative approach* would require that all food products placed on the UK market must originate from farms that can demonstrate compliance with sustainable pesticide use and pesticide management principles and practices. Compliance could be assessed based on: (i) the applicable regulatory framework at farm level; or (ii) certification with a credible third party-verified environmental assurance scheme. A major challenge for regulators would be to determine how such requirements could be made specific enough to still be meaningful while being applicable across jurisdictions and farm management systems.

A summary of the legal analysis conducted is set out in the table below. It shows that Option B, the flexible quantitative approach, would be the best approach to adopt. While option A would be too inflexible, Option C would likely not be stringent enough to meet the UK's objective of protecting pollinators by restricting the use of neonicotinoids in agri-food products. Option B would require robust evidence that the use of neonicotinoids and the import tolerances requested were not associated with risk to bees and other pollinators during their use in the exporting country. The in-built flexibility of Option B should be understood as a way to

[3] This is more than a theoretical possibility. UK producer interests have asked for review of the precautionary and stringent EU hazard-based approach to pesticide approval. See National Farmers Union (NFU) (2018), "Improving Pesticide Regulation", available at: https://www.nfuonline.com/media/wdpmdwle/improving-pesticide-regulation.pdf

strengthen the environmental objective of the measure, by offering an objective mechanism to evaluate that the environmental objective of the measure applies in the respective circumstances faced by the trading partner.

Moreover, when making justification arguments focused on the necessity of the measure on the basis of the environmental objective it seeks to accomplish, it would be important to ensure a sufficient nexus between the UK and the environment. This could be done by focusing on the global commons of protecting biodiversity or on the basis of public morals, which would emphasise the link between citizens and consumers and bee population welfare.

Summary of key findings of neonicotinoids CES analysis

	Option A	Option B	Option C
Discrimination	While arguments could be made that products treated with neonicotinoids and those not treated with neonicotinoids are not "like" based on different physical characteristics (neonicotinoids residue) and consumer preferences, these arguments might not be sufficient, and a panel could still consider the two products to be "like". If products were found to be "like", there could be findings of *de facto* discrimination depending on whether the measure modified conditions of competition and depending on application and implementation of the measure. This discrimination can be justified, provided it meets the conditions set out in Article XX of the GATT, or, if analysed under the TBT Agreement, if it is the result of a legitimate regulatory distinction and meets various other conditions. This leads us to explore the measure's legitimate regulatory objective, even-handedness and trade-restrictiveness, as set out below.		
Legitimate regulatory objective	Important to consider how to frame objective of the measure. Possible framing could include seeking to protect global bee populations, by ensuring that the UK market is not used to encourage agricultural production in a manner that adversely affects bee populations.		
Extraterritoriality concerns	Need to establish "sufficient nexus" between the measure's objective and UK territory. This can be done either through public moral arguments or global environmental harm routes (i.e., establishing that harm to bee populations outside the UK harms biodiversity globally, which impacts the UK).		
Even-handedness	The measure does not allow examination into whether it is appropriate to importing countries,	The measure would enable taking into account importing countries' conditions, thus, being even-handed.	The measure would enable taking into account importing countries' conditions, thus, being even-handed.

	Option A	Option B	Option C
	thus, likely not even handed.		
Trade-restrictiveness of the measure	Because it requires MRLs at LOQ without allowing for import tolerances, this would be the most trade-restrictive measure. A panel could find measure not necessary to achieve legitimate regulatory objective.	This option is less trade-restrictive than Option A, as it allows for an examination of the conditions in the exporting country.	This option is less trade-restrictive than A and B, as it does not impose restrictions on products on which neonicotinoids have been used. However, it may not be stringent enough to meet the UK's appropriate level of protection.

Case study 2: Nitrogen application levels

The case for CES for nitrogen application

Nitrogen is one of three macro-nutrients essential for all plant growth. To promote plant growth in agriculture, nitrogen is applied to crops and grassland as a mineral fertiliser and in various organic forms as animal manure, composts or ploughed-in crops. Environmental challenges have arisen in relation to nitrogen use, because its cumulative annual use over decades (coupled with mechanisation and use of pesticides) has degraded soils and led to the over-enrichment of agricultural land and its surroundings as well as polluted water bodies and ground water. Excess nitrogen results in biodiversity degradation in and around fields and the eutrophication of water bodies, which, in the extreme, causes complete destruction of marine and aquatic environments and, eventually, coastal waters. The degradation of terrestrial and aquatic biodiversity are matters of global concern; significant transboundary effects occur as lakes, seas and coastal waters are impacted.

The regulatory framework for nitrogen in the UK is based on laws for nitrates, water and agriculture. Derived from the objectives of these regulations are mandatory good practice codes, which include nitrogen management guidelines and establish maximum limits of nitrogen use on farms (the norm is 170 Kg N/hectare in the UK/EU). The Farming Rules for Water[4] regulate

[4] UK Department for Environment, Food and Rural Affairs (Defra) (2022), *Statutory Guidance: Applying the farming rules for water*, available at: https://www.gov.uk/government/publications/applying-the-farming-rules-for-water/applying-the-farming-rules-for-water#:~:text=The%20farming%20rules%20for%20water%20were%20introduced%20to%20reduce%20and (accessed 27 May 2022).

nitrogen over all cultivated areas and grassland, and the most stringent regulatory requirements are applied to areas most suffering from nitrogen excess in water, which are designated as Nitrate Vulnerable Zones (NVZs). The key principle is that nitrogen application should be related to crop needs. The guidelines for the practical application of nitrogen and the associated enforcement inspections are implemented through mandatory cross-compliance rules for claimants of public payments under agricultural policy. The same guidelines are also embedded in the widely used Red Tractor industry certification scheme for food and agriculture. The complexity of the nitrogen guidelines manifests as a wide range of nitrogen application rates allowable depending on the crop, soil type, season and expected yield. This creates a challenge when seeking to define a straightforward CES on the basis of UK regulation.

Moreover, nitrogen regulation in other jurisdictions can be similarly complex. This means that assessing the relative stringency of these regulations compared to the UK requires investigating the detailed operational content of these regulations and handbooks to see what facets are covered and how they are covered, and to understand which aspects are advisory and which are mandatory in the inspection and enforcement regimes. These tasks are time-consuming and resource-heavy and, therefore, would be a difficult and perhaps impractical way of establishing a foundation of CES for nitrogen. Therefore, when analysing nitrogen regulations in other jurisdictions, it would be a starting point to focus on the presence or absence of at least three critical aspects of nutrient regulation which can be meaningfully applied to jurisdictions even where the soil, climate, farming systems and practices are substantially different than in the UK:

- An evidence-based definition of nitrate vulnerable zones (or their equivalent).
- Operational requirements on farmers – with back-up recording and inspections – of the principle of nutrient application tuned to crop need.
- A requirement on farmers to have and to follow a whole farm nutrient plan.

Designing CES for nitrogen: Options and legal considerations

The most practical approach in designing a CES for nitrogen might be to evaluate institutional frameworks in areas with excess nitrogen use on the basis of the existence and enforcement of key nitrogen management principles and criteria. CES on nitrogen, for areas with excess nitrogen use, would thus concern whether there is a requirement in place to delineate NVZs or equivalent; whether farms are required to have integrated nutrient plans in line with crop requirements and with the aim of minimising nitrogen; and whether farmers are required to demonstrate compliance by keeping detailed records associated with their farm nutrient plan and their adherence to key nutrient-management principles.

Because all crops may receive nitrogen application, and noting that the intensity of nitrogen application is not discoverable by examining the products (e.g. wheat or oilseed), the trade sensitivity will have to be assessed on the basis of the largest agricultural trade flows from regions which would be classed as nitrate vulnerable. Priorities for the application of CES could also be set by focusing on product classes and countries where excess nitrogen use is most prevalent or most problematic from an environmental perspective.

It is suggested that the CES should focus on areas that are using, or at risk of using, excessive nitrogen in farming activities. Based on a benchmarking system, the UK can determine countries with low, medium or high risks of excessive nitrogen use. With respect to such high-risk (i.e. nitrogen-vulnerable) countries, three design options are proposed. Options A and B will take countries as a base level, while the third option (Option C) would be designed on a farm-level basis. Tailoring the measures to regions and/or farms at high risk reflects key principles that have been further developed in the context of sanitary and phytosanitary (SPS) measures, explained in Box 1 below.

- Option A: would require that a country with excessive nitrogen use establishes NVZs comparable or similar to NVZs defined in the UK, in addition to establishing nitrogen management requirements and quantitative limits for nitrogen use per crop similar to the limits applied in the UK.
- Option B: would require that a country with excessive nitrogen use establishes minimum nitrogen management principles. This should include: defining NVZs or equivalent; requiring farmers to use nitrogen application rates based on crop requirements; and requiring farmers to have a farm nutrient plan with appropriate nutrient use recording and inspections to check compliance.
- Option C: In contrast to Options A and B, which focus on nitrogen regulations, Option C would focus on specific farms in high-risk countries. Even if a high-risk country fails to establish minimum nitrogen management principles, Option C would give individual farmers the opportunity to engage in export trade provided that they meet the requisite nitrogen management standard – at the farm level. This reflects the concept of compartmentalisation, which is well established in the context of SPS provisions. One way to administer this would be to consider that have been certified by standard-setting organisations to have nitrogen management plans in place would be considered eligible for export.

The CES could also be a combination of the options set out above. For example, the CES could include a requirement for exports from NVZs to have minimum nitrogen standards in place. However, even if these standards are not in place, imports could be accepted from regions that can demonstrate that a nitrogen management plan is in place.

While refraining from making conclusions regarding the WTO-consistency of the proposed measure for nitrates, Options B and C appear to best reflect these legal principles. Compared to neonics, it will likely be more difficult to establish that the measure is not discriminatory, in part because whether or not a product has been cultivated with or without excessive levels of nitrogen does not alter the product physically. Moreover, for Options B and C, it is important to ensure that the set of requirements imposed on imported agri-products from high-risk areas are not more restrictive compared to UK regulations. CES that target high-risk nitrogen areas would, however, be *de jure* discriminatory, as they treat different countries differently.

As a result, CES on nitrogen will likely be analysed predominantly under Article XX exceptions under the General Agreement on Tariffs and Trade 1994 (GATT), or under equivalent provisions in the Agreement on Technical Barriers to Trade (TBT Agreement), which seek to identify whether discrimination can be justified. In this analysis, considerations of even-handedness are critical: whether the measure is necessary to achieve a legitimate regulatory objective, and whether there is a "sufficient nexus" between the objective of the measure and the

UK in light of extraterritoriality concerns. Options B and C would be considered more even-handed as they allow for conditions in the exporting country to be taken into account, whereas Option A does not, since it would require adherence to UK nitrogen regulation, which is based on UK characteristics. Similarly, Option A will be most trade-restrictive. Thus, from a legal perspective, it would be advisable to design CES for nitrogen on the basis of Options B and C, or a combination of the two.

Summary of key findings of the nitrogen CES analysis

	Option A	Option B	Option C
Discrimination	Given widespread similarities between products that have been cultivated with excessive nitrogen and those that have not, it will be very difficult to establish that these products are non-"like". As a result, CES on nitrogen will likely be found to be discriminatory if it is found to alter conditions of competition. Such discrimination can be justified under GATT Article XX or under the TBT Agreement if it is the result of a legitimate regulatory distinction and meets various conditions. This leads us to explore legitimate regulatory distinction, even-handedness and trade-restrictiveness, as set out below.		
	Important to design benchmarking of high-, medium- and low-risk countries with respect to excessive nitrogen use according to objective, origin-neutral criteria	Important to ensure that qualitative criteria implemented are not more stringent compared to nitrogen regulation in NVZs in the UK.	
Legitimate regulatory objective	Possible framing could include seeking to prevent eutrophication globally, by ensuring that the UK market is not used to encourage production in a manner that adversely affects aquatic ecosystem.		
Extraterritoriality concerns	"Sufficient nexus" could be demonstrated through the global harm route, by highlighting that nutrient loss ends up in the global commons (oceans, atmosphere etc.), and is also considered one of the nine global planetary boundaries not to be surpassed to maintain the earth's environmental stability. An alternative route could be through focusing on public morals, similar to in *EC – Seal Products*.		
Even-handedness	By requiring compliance with UK nitrogen regulations, it does not allow consideration of	Depending on the exact requirements that must be complied with, this measure would be sufficiently	Depending on the exact requirements that must be complied with, this measure would be sufficiently

	conditions in the exporting country, thus, likely not even-handed for purposes of GATT Article XX.	flexible to take into account conditions in the exporting country.	flexible to take into account conditions in the exporting country
Trade-restrictiveness of the measure	Important to ensure that measure is designed to target areas of high risk of excessive nitrogen use (NVZs/high risk countries). Option A is the most trade-restrictive of the options analysed.	Important to ensure that measure is designed to target areas of high risk of excessive nitrogen use (NVZs/high risk countries). Option B is less trade-restrictive than Option A.	Important to ensure that measure is designed to target areas of high risk of excessive nitrogen use (NVZs/high risk countries). Option C is less trade-restrictive than Option A.

<u>Key observations</u>

Based on this analysis, key observations relevant to CES are summarised below:

- In the process of developing CES, the identification of existing UK regulatory requirements and standards is important. Where this is challenging due to devolved administrations, overlapping regulations, and the sheer complexity of multi-layered regulation and the enforcement of rules, it is critical to reveal a core set of requirements that express a baseline that all UK farmers are required to adhere to. This may have to be done in qualitative terms – as was found for the nitrogen case.
- It is important to allow the particular conditions and circumstances of exporting countries to be taken into account. This can be achieved by building in flexibility mechanisms in the CES themselves. Rather than undermining the environmental objective of the CES, such flexibilities should help CES fulfil their intended environmental objective in the most environmentally efficient and effective manner, despite the differences in geographies between trading partners. This is also important from a trade law perspective: on the one hand, it is important in order to ensure that the CES are designed in alignment with key principles under trade law; whereas, on the other hand, it is important to minimise potential negative implications for developing countries associated with CES.
- Enforcement of existing environmental regulations is also critical. A situation in which a regulation is not adequately enforced for UK farmers but would be strictly enforced for imported agri-food products would constitute discrimination under trade law.
- Trading partners may raise the fact that UK farmers are beneficiaries of generous public payments, which offset any additional costs of more stringent environmental requirements. This can be rebutted on the basis that the objective of CES is primarily to reduce the environmental damage associated with production operating at low standards.

- To minimise the administrative burden and cost of CES, regulators are encouraged to build upon existing procedures, systems, certifications and standards where possible. For example, applying benchmarking and equivalence assessments for credible voluntary sustainability standards (VSS) could help simplify procedures that are already complying with high market-led sustainability requirements. In such cases, regulators would undertake an assessment of relevant VSS to assess which could be considered as automatically compliant with the requirements of the CES, and thus help avoid producers under the relevant schemes having to produce additional proof of compliance.
- It is important to take into account considerations of fairness vis-à-vis developing country trading partners when designing CES. In the development of CES, it should thus be evaluated how the requirements of CES can be designed in such a way that they are proportionate to the respective environmental impact associated with the producer or product group. Equally, the design of the measure should take into account the different conditions and characteristics of developing countries and especially small and micro farms and producers. The CES can also reflect developing country concerns by building in the provisions of exceptions, possibly time-limited, where this is warranted. In addition, the UK would have a responsibility to provide both financial as well as technical assistance to ensure that developing countries can meet CES. Another critical element of a just transition for developing countries concerns providing adequate transition periods for developing countries. There are precedents in the TBT Agreement and the Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement) to allow for these considerations. UK developers of CES should furthermore ensure that this concept is embedded in broader political strategy towards promoting sustainable development in developing countries.
- More generally, fair and inclusive implementation of CES implies a comprehensive consultation process between the UK and its trading partners that starts from the beginning of policy development, in which the WTO can play an important role as a standing forum for consultations and informal exchange between trading countries. The process for CES would be similar to that of other policy issues, and numerous good practice examples exist from the environmental policy sphere and other fields of policymaking.

Reflections and outlook

In the process of searching for relevant CES case studies in order to address some of the major global environmental challenges thrown up by the prevalent food production systems, it became apparent that environmental policy objectives are often spelled out in general terms – such as reducing greenhouse gas (GHG) emissions, and reversing the degradation and loss of biodiversity – which are not easily specified for legal and policy purposes. This apparent simplicity contrasts with the often highly complex array of regulatory instruments used to achieve the environmental objectives, which are generally based in agricultural policy. Indeed, it was observed, especially in the nutrients case study, that policy instruments to raise environmental performance are often of a broad-spectrum and cross-cutting nature. Each agricultural policy measure may contribute to several environmental issues, reducing water and air pollution and biodiversity loss, and offering climate protection. It is sometimes hard to separate and link specific policy measures, i.e. standards, with specific environmental issues. Compounding the challenge, farming systems under different climatic and soil conditions across the world themselves pose different environmental challenges and produce a wide range of products. Yet, in dealing with international trade implications of a measure, CES have to be considered case-by-case and according to how they relate to specific products.

On the basis of a new emerging consensus on the need to transition away from the twentieth-century model of agriculture towards a more sustainable one, new initiatives are being embraced. These offer different models to significantly diminish the negative environmental footprint of agriculture irrespective of location or the type of agricultural system in place. The first model is sustainable intensification, whereby the power of data, digitisation, GPS mapping and robotics are harnessed to significantly reduce the volume of crop protection products and nutrients applied to crops through increased precision of treatment levels in relation to soil, crop and pest conditions. The other model is to switch to cropping systems that can be subsumed under regenerative, agro-ecological and indeed organic farming approaches to reduce cropping intensity by relying less on synthetic inputs and more on natural processes for the nutrients and crop protection. Proponents of each of the two agricultural production systems are not easily convinced by the respective alternate approach. Yet, they have in common a recognition that the environmental performance of agriculture, especially with respect to biodiversity and climate, must improve. In particular, they share a vision that a future agricultural system needs to reduce the use and harm from pesticides and excess nutrients. If sensitively approached, the development of CES for nutrients and pesticides can build on this and start creating a common basis for a larger-scale transition to sustainable agriculture.

Well-specified CES will be an important ingredient in promoting the transition to sustainable agriculture worldwide. There is little doubt that one of the obstacles in encouraging a wider and faster take-up of sustainable farming approaches in any one country is the fear that such efforts will be undermined by uncontrolled imports from regions where unsustainable farming practices are still permitted. The principle of equality of treatment of domestic production and imports is a vital component in the drive towards global sustainable food production.

The case studies examined in this report are intended to illustrate how a country might go about developing CES in practice, in order to address some of the most pressing environmental problems that are particularly linked to agricultural trade. In doing so, this study provides several design options that regulators can opt for while highlighting considerations that are relevant to take into account from a trade law perspective. A general conclusion is that even though most environmental issues will concern the application of CES based upon criteria that cannot be detected in the product themselves but, instead, the product and process methods (PPMs), nothing in the WTO provisions or jurisprudence precludes, in principle, differential treatment of products on the basis of PPMs. Whether or not a measure that sets out PPM requirements complies with the relevant WTO provisions depends on the way the measure is designed and applied. This study has examined the design of CES for the case of two very specific environmental issues. However, there are a great number of areas that would lend themselves to the development of CES, such as those related to climate change, environmental impact assessments, water stress and deforestation. Also, there are numerous other pesticides than those examined in this report that are not approved in the UK but are available in many large agricultural exporting countries. For these pesticides, the application of CES might also prove sensible. Similarly, the overuse of phosphorus in agriculture may merit closer examination.

Finally, it is hoped that the methodological approach and set of case studies developed in this study will help to make CES more tangible to agriculture, trade and environment stakeholders alike, while helping to exemplify the potential of CES in supporting countries' transition to sustainable trade and agricultural systems.

1. Introduction

In the post-Brexit era, the United Kingdom (UK) finds itself at a critical juncture as it asserts its position as a global climate leader, rethinking and reshaping its environmental, agricultural, trade and food policies. Domestically, the transition from the European Union (EU)'s Common Agricultural Policy (CAP) to a new policy centred around environmental land management is creating new opportunities for the UK to rethink environmental standards applicable to food and agriculture. At the international level, the UK is now an independent trading nation before the World Trade Organization (WTO) and is, in parallel, negotiating regional trade agreements (RTAs) with key trading partners, several of which are significant agricultural exporters.

A key issue that has received a great deal of attention during these political developments concerns trade and environmental standards in agriculture. Currently, UK farmers must comply with a large number of mandatory environmental requirements set out in UK law. However, these requirements are not imposed on relevant agri-food products imported into the UK.

This situation is unsatisfactory. The UK imports nearly 50% of the agri-food it consumes.[5] The fact that there is no system in place to regulate the environmental performance of almost half of the UK's agricultural consumption means that the UK has an undesirably large external environmental footprint – despite the stringent environmental regulations to which UK farmers are subject. At the same time, if the share of agricultural imports expands, environmental leakage may get worse, resulting in the further externalisation of the environmental impact of consumption in the UK to third countries. The uneven playing field that emerges from importing agri-food products that are not subject to environmental standards similar or comparable to those applied in the UK also risks worsening the UK's environmental footprint, if the implementation of more stringent environmental requirements leads UK producers to become less competitive vis-à-vis foreign producers not subject to the same or comparable standards.

In the long term, the competitive pressures experienced by the agri-food industry may lead to pressures on policymakers to 'level down' the playing field, increasing the domestic environmental costs of agricultural production. The UK Board of Trade's Green Trade report (2021) highlights that "[d]iverging environmental standards risk undermining free and fair trade by creating uneven market conditions between countries."[6] Concerns about the implications of opening the UK market to agri-food imports that are subject to less stringent environmental

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[5] Global Food Security (GFS) (n.d.), *The Challenge – UK Threat*, available at: https://www.foodsecurity.ac.uk/challenge/uk-threat/; DEFRA (2021), *UK Food Security Report*.

[6] UK Board of Trade (2021), "Green Trade", available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1008120/board-of-trade-report-green-trade.pdf

standards compared to the UK have also been raised by the National Farmers Union (NFU)[7], which received over a million signatures for a petition to "review trade policy and develop solutions that can hold all food imports to the UK's high standards".[8]

Acknowledging these concerns, the UK Government has repeatedly affirmed its commitment "not to compromise on the UK's high environmental protection, animal welfare and food standards."[9] Advisory bodies in the UK have also emphasised the importance of developing core environmental standards (CES), that is, mandatory environmental requirements set out in UK law that would be applicable to all relevant agri-food products imported into the UK. For example, the Trade and Agriculture Commission (TAC), established in July 2020 to advise the UK government on how to best incorporate the interests of the British public, farmers and domestic producers in future trade agreements[10], recommends that the UK Government develop an ambitious agri-food strategy based on "a liberalised approach to trade policy, [...], tempered with safeguarding important standards", both internationally and at the national level.[11] The National Food Strategy Independent Review from July 2021[12] underscores the recommendations raised in the TAC and emphasises the need to ensure that trading partners demonstrate equivalence through core standards.[13]

To be clear, CES do not seek to redesign existing UK environmental regulation. Instead, they seek to expand the scope of existing environmental regulations to apply not only to UK farmers but also to relevant imported agri-food products. As is currently the case for UK food safety standards, failure to comply with these environmental requirements would mean that the agri-food product at issue cannot enter the UK market. It is also important to highlight that the development of CES is not affected by the stage of implementation of UK trade deals. As a policy measure enshrined in UK law, CES would apply to importers across the board, irrespective of the ratification of a free trade agreement (FTA) between the trading partners.

Despite the momentum that is being built for the development of CES, many questions persist as to whether, and how, this can be done. Which environmental issues should be addressed first? Can UK environmental requirements simply be imposed on imported food products or will they

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[7] Farming UK (2021), "UK concerns over lower food standards in CPTPP trading bloc", available at: https://www.farminguk.com/news/uk-concerns-over-lower-food-standards-in-cptpp-trading-bloc_57984.html.

[8] NFU (n.d.), *Food Standards Petition*, available at: https://www.nfuonline.com/archive?treeid=141706

[9] Defra Press Office (2020), *Protecting our high food standards*, available at: https://deframedia.blog.gov.uk/2020/10/08/protecting-our-high-food-standards/

[10] UK Department of International Trade, Trade and Agriculture Commission (2021), "Final Report", available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/969045/Trade-and-Agriculture-Commission-final-report.pdf

[11] Ibid.

[12] National Food Strategy (2021), *An independent review for Government: The Plan*, available at: https://www.nationalfoodstrategy.org/.

[13] Ibid.

have to be redesigned to reflect conditions in exporting countries? How can CES be developed in a WTO-compliant manner? How can developing countries' needs and concerns be taken into account? What kind of implementation challenges will be encountered and how can these be addressed? How can such a measure be implemented in a manner that is feasible for regulators, custom officials, producers and retailers alike?

This report seeks to shed light on these and other questions by explaining what needs to be done – both on the scientific and the legal side – to develop CES in the UK. To make the discussion around CES and their implementation more tangible, this study focuses on designing CES for two case studies, selected on the basis of the environmental harm they seek to address and their sensitivity to trade policy-related changes: the UK's regulation on the ban/non-approval of three neonicotinoids to avoid negative impacts on bee populations; and the UK regulatory requirements to reduce excessive nitrogen use in Nitrate Vulnerable Zones (NVZs) to, *inter alia*, protect aquatic life. These regulatory requirements currently only apply to domestically produced agri-food products and are not applied in the same manner to imported products.

For each of the two case studies, this report analyses how existing UK environmental requirements can be applied to imported agri-food products. Specifically, each case study sets out existing regulations and standards, and explores how they address the identified environmental harm. It further proposes several policy options for the CES and evaluates them based on their effectiveness in achieving the UK's intended environmental objective, as well as their alignment with key WTO principles. Finally, it explores the implications of the different CES on vulnerable producers in developing countries.

Through the two case studies, this report highlights how CES for the globally important issue of biodiversity protection can facilitate the transition to sustainable agri-food systems in the UK and beyond, while taking into account relevant legal obligations under the WTO. It has developed a methodology that can be followed when designing CES for environmental issues not included in this study.

This report proceeds as follows: section 2 sets out the relevant background and context in which the UK's interest in developing CES for imported agri-food products must be situated, including an overview of how CES are being handled in other contexts around the world, and how they can be compared to food safety standards. Section 3 sets out the methodology to be followed when developing CES to address specific environmental issues, which has been applied to the case studies, and which could be extended to address other environmental issues not covered in this report.[14] Section 4 sets out the two case studies: one for neonicotinoids and the other for excessive nitrogen use. For each of the two case studies, section 4 makes various CES design suggestions, followed by a legal analysis of the options proposed, looking at key WTO principles. Finally, section 5 sets out general reflections on the two case studies, followed by the identification of CES to be explored in future studies as well as a section on developing country considerations. Section 6 provides concluding remarks.

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[14] Note that the implementation considerations have not been fully developed in the case studies in this report.

2. Background

2.1 What do we mean by core environmental standards (CES)?

For purposes of this report, the term "core environmental standards" or "CES" refers to the application of binding environmental regulations for UK agri-food production in the UK to imported agri-food products.[15]

Specifically, when utilising the term "CES", this study refers to measures that are unilaterally adopted by the UK, as opposed to reciprocal; measures that are national, as opposed to plurilateral or multilateral; and measures that are mandatory as opposed to voluntary. As further explained below, this contrasts with, but does not replace, other approaches towards CES that are ongoing and should continue in parallel to efforts made to advance CES.

2.1.1 Unilateral versus reciprocal

As part of the unilateral approach, the UK would adopt CES as a domestic policy measure without prior negotiation or approval of counterparties in any existing or forthcoming RTAs. The benefit of this approach is that it can be followed irrespective of what happens in ongoing RTA negotiations. This provides more flexibility in developing CES and ultimately allows for consistency in the application of CES to all imports, not just to imports covered by specific RTAs. Moreover, it enables the adoption of CES within a reasonable timeframe.[16] While this approach is unilateral, engagement with trading partners should be considered as an important element from the very beginning of the policy process so as to ensure that the concerns of UK trading partners can be addressed at an early stage.

An alternative or complementary approach would be for the UK to negotiate CES as part of a bilateral understanding and/or an RTA.[17] Within the framework of RTAs, trading partners can agree to condition preferential market access on the basis of adherence to a specific standard.

[15] We note that this deviates from the distinction between "standards" and "technical regulations" under the TBT Agreement. Under the TBT Agreement, a technical regulation is considered mandatory, whereas the use of the term "standard" indicates that compliance is voluntary.

[16] Lamy, P., Pons, G., Garzon, I., Hub, S. (2022), *A narrow path for EU agri-food mirror measures?*, available at: https://www.europejacquesdelors.eu/publications/grape-2-a-narrow-path-for-eu-agri-food-mirror-measures.

[17] Rees, R. (2022), Mirror, mirror on the Wall, Who has the Fairest Clauses of Us All? Stress-testing the Application of Mirror Clauses to Pesticides, European Centre for International Political Economy (ECIPE), available at: https://ecipe.org/publications/applications-of-mirror-clauses-to-pesticides/

For example, this approach has been adopted in the EFTA-Indonesia Comprehensive Economic Partnership Agreement (CEPA), which has conditioned preferential tariffs on palm oil on sustainable production.[18] Given that existing RTAs negotiated by the UK have not taken this route thus far, the unilateral route should be pursued, at least in parallel to RTA negotiations.

2.1.2 National, plurilateral or multilateral

The focus of CES examined in this report is national. Indeed, the report takes relevant environmental requirements in UK agri-food production as a starting point and subsequently inquires how these can be applied to imported products. The benefits of focusing on the national level is that CES can be realized in the short- to mid-term, which, in turn, can be used to feed into the development of global environmental standards.

At the same time, given the global nature of the environmental issues at hand, it will also be critical to move towards a coordinated approach over time. Thus far, existing international agricultural standards cover food safety (Codex Alimentarius), animal health (World Organisation for Animal Health (OIE)) and plant health (International Plant Protection Convention (IPPC)), but do not directly address the environmental impact of agri-food production. For this reason, the TAC recommended the UK to "champion the creation of a global standards framework for the environment", alongside the establishment of national standards, referring to the World Wildlife Fund (WWF) Codex Planetarius as a model from which to build these ambitions. The WWF Codex Planetarius proposes a framework that could serve as the baseline for the development of international environmental standards.[19] This framework would focus on the most important globally traded foods and soft commodities and key environmental impacts associated with agri-food production.[20]

Absent a set of widely recognised international standards, the UK could engage in a standards development process at the plurilateral level as well. To do so, it would be important for the UK to assess if alignment with its trading partners could be sought in the short-to-mid-term via a plurilateral initiative among like-minded countries, with the aim of broadening engagement over time. In this connection, it could be highly effective to work with the EU on developing CES, given that UK and EU environmental policies are strongly aligned. The EU is the UK's largest trade partner and is actively engaged in developing environmental standards, for example, the Carbon Border Adjustment Mechanism (CBAM). The EU is furthermore in the process of

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[18] Sieber-Gasser, C. (2021), *The EFTA-Indonesia Template for Sustainable Palm Oil-and for Human Rights?*, available at: https://www.humanrightsincontext.be/post/the-efta-indonesia-template-for-sustainable-palm-oil-and-for-human-rights

[19] Clay, J. (2016), *Codex Planetarius*, available at: https://www.worldwildlife.org/publications/codex-planetarius.

[20] Deere Birkbeck, C. (2021), *Greening International Trade*, The Graduate Institute of Geneva, available at: https://www.graduateinstitute.ch/communications/news/greening-international-trade-pathways-forward

developing so-called "mirror clauses", which aim to make market access conditional upon compliance with domestic environmental, animal welfare and health standards and regulations.[21]

The development of CES at the national or plurilateral level should be approached as processes that are complementary and mutually reinforcing. Indeed, CES at the national level could catalyse international policy action and offer a starting point for engagement between the UK and its trading partners.

2.1.3 Voluntary versus mandatory

This report focuses on rendering UK statutory standards mandatory for imported agri-food products. By rendering compliance with relevant environmental regulations a mandatory requirement for the import of agri-food products, CES have the potential to level the playing field between domestic and imported agri-food products and tackle environmental leakage. Mandatory CES can also complement and address shortcomings currently experienced with voluntary sustainability standards (VSS) and other market-led approaches. A well-known limitation of VSS is that they tend to foster better production outcomes among those producers that are already high performing, rather than lifting up market "laggards". Research has shown that producers with the lowest environmental performers generate 50% of the negative global environmental impact associated with agricultural commodities, while only producing 10% of the product consumed.[22] This means that failure to ensure that producers with the lowest environmental performance are subject to sustainable production requirements will make it difficult to achieve progress towards environmental sustainability. In contrast to voluntary approaches, mandatory CES will require all producers to comply with sustainability requirements.

Nevertheless, in designing CES, there exist opportunities to build upon and leverage existing voluntary and market-based standards. First, the experience gained by organisations setting and verifying global sustainability standards offers insights into the design of CES. Second, by benchmarking CES on existing standards, or recognising VSS as a mechanism to demonstrate compliance with CES, voluntary standards can facilitate uptake and help minimise the creation of new barriers to trade. This is particularly relevant in situations where voluntary standards have become *de facto* mandatory because compliance is required by large retailers.[23]

At the same time, benchmarking CES on existing VSS should not be understood as a panacea: it will not facilitate market access for small-scale exporters that struggle to comply with voluntary standards in the first place. Also, as is further elaborated below, it raises the question as to what standards to use for benchmarking. Another consideration relates to the value added for

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[21] Lamy et al. (2022), *A narrow path for EU agri-food mirror measures?*, available at: https://www.europejacquesdelors.eu/publications/grape-2-a-narrow-path-for-eu-agri-food-mirror-measures.
[22] Poore, J. and Nemecek, T. (2018), "Reducing food's environmental impacts through producers and consumers", *Science*, 360(6392), pp. 987-992.
[23] For example, the British retail giant Tesco has announced that it will require all of its fresh produce to be LEAF-certified by 2022 (for UK growers) and by 2025 (for its global growers).

smallholders from an economic perspective: while benchmarking can avoid adding additional market access barriers for producers of products already certified, without a continued increase in market demand for certified products, it may lead to "over-certification" of products that can only be sold at a premium price[24], leading to the question of who should bear the cost of certification.

In sum, while there are various approaches to CES, in this report we focus on CES that are unilateral, national and mandatory. The development of CES can be explored in parallel to other approaches to advance CES in agri-food products, including through incorporating standards in RTAs, developing a set of global environmental standards (i.e. the Codex Planetarius) and strengthening relevant voluntary standards.

2.2 Why subject imported agri-food products to CES applied in the UK?

The UK imports nearly 50% of the agri-food it consumes.[25] Nevertheless, at present, there is no system in place to regulate the environmental performance of agri-food imports. With the UK's policies for trade, environment and agriculture in flux, farmers and other relevant stakeholder groups have shown concern over the direction of UK agriculture. Baldock (2020) highlights the tension in seeking to apply high environmental standards in one country while a significant share of consumption of products that are traded are not subject to similar regulatory standards. An uneven playing field risks circumventing the very purpose of domestic regulation. In the absence of a level playing field, higher costs of compliance with domestic environmental standards may lead producers to become less competitive vis-a-vis foreign producers not subject to the same or comparable standards. At the same time, if the share of agricultural imports expands, environmental leakage may occur, resulting in the further externalisation of the environmental impacts of consumption to agri-food exporters.[26] Longer term, the competitive pressures experienced by the domestic agri-food industry may lead to pressures on policymakers to 'level down' the playing field, increasing the domestic environmental costs of agricultural production. As a domestic trade policy instrument, CES have been proposed as a promising policy measure to prevent such a scenario.

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[24] FAO, UNCTAD, UNEP, UNIDO, ITC and UN Forum on Sustainability Standards (2020), *Scaling up Voluntary Sustainability Standards through Sustainable Public Procurement and Trade Policy*, available at: https://digitallibrary.un.org/record/3887340.

[25] GFS (n.d.). Ibid.; Defra (2021), *UK Food Security Report*.

[26] Organization for Economic Co-operation and Development (OECD) (2017), *Trade and Environment Interactions: Governance Issues*, available at: https://www.oecd.org/sd-roundtable/papersandpublications/Trade%20and%20Environment%20Interactions%20FINAL.pdf; Matthews, A. (2020), *Impact of food trade on climate*, Trade Unwrapped, available at: https://tradeunwrapped.uk/read/impact-of-food-trade-on-climate.

Following its exit from the EU, the UK is in the process of negotiating RTAs with third countries. Recently negotiated UK RTAs do not require that imported agri-food products comply with UK environmental standards. While they do include a chapter on the environment, the provisions in these chapters tend to focus on the obligation to cooperate, or highlight the parties' recognition of the importance of various environmental actions and principles.[27] With regards to environmental laws, these chapters merely note that "each party shall strive to ensure" that its environmental laws provide for high levels of environmental protection. They do not, however, require agri-food products to comply with the importing country's environmental standards. If no environmental criteria are set for agricultural imports, environmental leakage may occur. As a result, the UK lacks a vital mechanism to manage the environmental impact of its consumption, including through leveraging demand to support the transition towards sustainable agriculture. Environmental leakage could be prevented through the development of CES. By seeking to equalise the playing field, CES, which would require imported agri-food products to comply with environmental regulation equivalent to UK farmers, could contribute to the UK's policy agenda and help it foster alignment between different regulatory objectives.

Recent policy efforts by the UK, such as due diligence requirements to tackle illegal deforestation in UK supply chains, suggest an interest in ensuring that domestic standards should not be compromised in international trade. Given the strong linkages between the agri-food sector and global environmental degradation, a transition to sustainable agri-food trade is imperative.

At the multilateral level, the UK is participating in WTO initiatives towards fostering environmental sustainability in international trade, such as the Trade and Environmental Sustainability Structured Discussions (TESSD), launched in 2021, fisheries negotiations, and the Informal Dialogue on Plastics Pollution and Environmentally Sustainable Plastics Trade. It is important to emphasise that CES should neither preclude nor replace other areas of political engagement such as the UK's active role in trade and environment discussions in the WTO. Indeed, international policy engagement is essential to make progress on national-level policy measures on CES and vice versa. Continued engagement with trading partners over national-level policy developments that affect trade flows is fundamental to political dynamics in international trade. For CES, this also means that a two-way engagement with trading partners, which offers opportunity for consultation and comments long before new policy measures come into place, is vital.

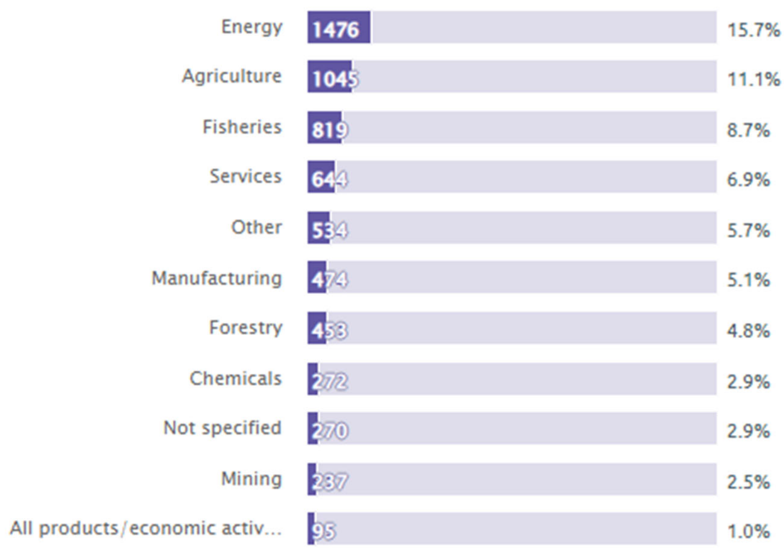
To date, the UK has been hesitant to consider CES as a part of its policy toolbox, citing concerns over WTO legality as well as potentially adverse impacts for developing countries. However, in today's political climate, it is important to recognise that the international policy debate is moving from 'if' to 'how' to implement trade-related environmental measures.

Data from the WTO's Environmental Database shows that WTO Members are increasingly making use of trade or trade-related policy measures to promote environmental objectives. As illustrated in Figure 1 below, while measures are implemented across all sectors, they are most

[27] See e.g. UK-Australia FTA, Chapter 22: Environment, available at: UK-Australia FTA Chapter 22: Environment - GOV.UK (www.gov.uk).

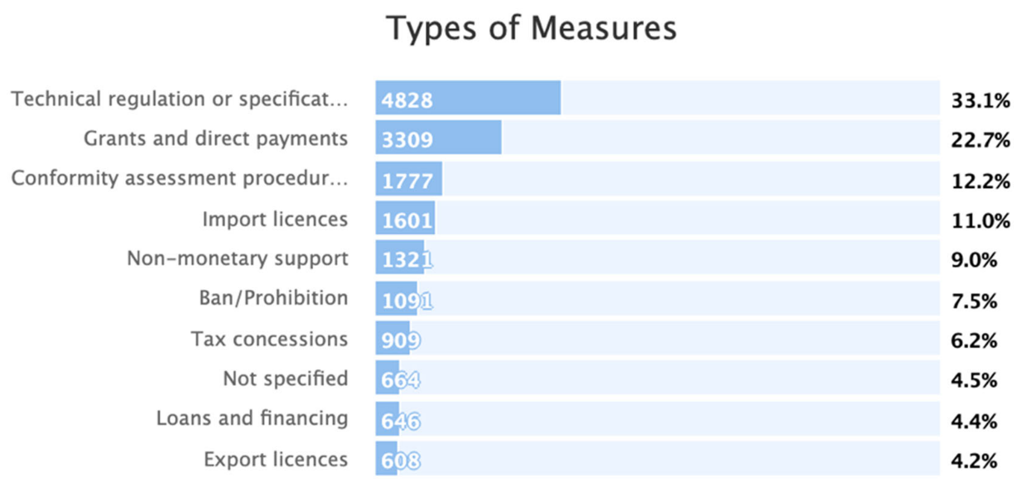
prevalent in energy (15.7%), agriculture (11.1%), fisheries (8.7%) and services (6.9%).[28] Figure 2 below furthermore shows that countries are making use of many different types of trade policy measures to promote environment objectives, with technical regulation or specification employed most frequently (33%), followed by Grants and Direct Payments (22%), conformity assessment procedures (12.2%) and import licenses (11%).

Figure 1. Type of trade-related environmental measures adopted and notified by WTO Members[29]



[28] WTO, Environment-related Notifications and measures by Member, available at: https://edb.wto.org/charts.
[29] Ibid.

Figure 2. Trade-related measures put in place by WTO Members to achieve climate-related objectives (2009-2019), as notified to the WTO Secretariat[30]



As will be further elaborated in the case studies below, WTO rules generally do not preclude countries from adopting environmental measures – even if these affect trade. Rather, these rules are meant to guide countries in designing and implementing policy measures in a manner that aligns with general principles established by trade agreements. In this regard, the WTO Secretariat notes "the general approach under WTO rules has been to acknowledge that some degree of trade restriction may be necessary to achieve certain policy objectives as long as a number of carefully crafted conditions are respected."[31] It is thus less a question of *if* CES are possible in the context of international trade than *how* they have to be designed, so that they are appropriate, not more trade-restrictive than necessary, credible, transparent and ready for scrutiny by trading partners. This also applies to the way the measure relates to developing countries. Again, fairness and cooperation are essential, which includes comprehensive support measures for developing countries. This will be further addressed in the context of the specific case studies in the subsequent sections.

2.3 CES: an emerging regulatory approach

2.3.1 Comparing CES with food safety standards

Ensuring that imported agri-food products comply with relevant regulatory requirements is not a novel idea. For decades, in areas related to health, safety and ethical concerns, countries have mandated that standards be upheld not only in domestically produced food but also in imported

[30] WTO (2021), *Trade and Climate Change Information Brief N°1*, available at: https://www.wto.org/english/news_e/news21_e/clim_03nov21-1_e.pdf.

[31] WTO (n.d.), *WTO – Trade and environment – Climate change and the potential relevance of WTO rules*, available at: https://www.wto.org/english/tratop_e/envir_e/climate_measures_e.htm.

food products. Food safety standards upheld by countries to ensure food safety and quality were grouped together to form the Codex Alimentarius of the UN's Food and Agriculture Organisation of the United Nations (FAO). The Codex Alimentarius provides food safety standards for most foods, including by establishing limits on residues of toxins in a product. It comprises 13 volumes of internationally accepted food standards applicable both to specific commodities and general standards that are cross-cutting and apply to all aspects of food products (e.g. food additives, hygiene and labelling). In 1994, the Codex Alimentarius became the global legal standard for food safety, as it was incorporated in the Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement) of the WTO. Since then, it has become widely accepted that, when engaging in trade, an exporter would need to meet the importing country's sanitary and phytosanitary (SPS) requirements, including for food safety.

CES, however, fall far behind the trajectory that led to internationally recognised food safety standards. While environmental standards in agri-food production have existed for decades, they are generally not applied to imported agri-food products. In part, this can be explained by the fact that political concern over environmental changes is more recent. However, the intrinsic difference that exists between food safety standards and environmental standards also plays a role. While food safety standards pertain to the physical characteristics of the product, environmental standards in food products mostly focus on managing natural resources to grow the product (e.g. limits to applying pesticides; requirements for acceptable levels of airborne pollutants from agricultural operations; climate impacts of farming; requirements concerning acceptable levels of nutrients; and limitations on potentially damaging changes in land use). Thus, while food safety standards tend to regulate the product itself, environmental standards focus on regulating the production process. This indirect relationship between the environmental standard and the food product further adds complexity.

For example, it is relatively straightforward to establish thresholds that measure toxins and contaminants in food products. It is much less straightforward to do so for environmental impacts associated with production processes. In part, this is because these are often not measurable in the products themselves, but also because they occur in a spatially diffused way, resulting in long delays before their impacts become clear. Moreover, the focus on process, which is usually context-specific, can make it more challenging to establish a core standard that is relevant, appropriate and applicable across countries and climates. It also relies on making judgements about the equivalence of different processes and production standards that apply in different regions and countries.

2.3.2 Examples of mandatory environmental standards for imported products

There are a number of cases in which countries have already adopted, or are in the process of discussing, mandatory environmental standards for imported products. A well-known example of CES that focus both on imported and domestic production processes is the United States (US) Marine Mammal Protection Act (MMPA). Here, the focus was on how to impose on imported fish the US legislation that promotes the conservation of marine mammals and their ecosystems. The US enacted several related legislative acts aiming to limit dolphin by-catch for tuna sold in the US market, including on imported tuna. This legislation, dating back to the 1990s, was found to be WTO-inconsistent when challenged at the WTO[32], which resulted in various adjustments being made to the measure.

In 2016, the US issued a new regulation under the MMPA, requiring that foreign companies exporting certain types of seafood to the US that are associated with the risk of harming marine mammals must demonstrate that the seafood comes from fisheries governed by marine mammal protection that is "comparable in effectiveness" to US standards.[33] The MMPA import provisions rule, which is expected to take effect in 2022, has a far broader and more flexible scope than that previously established.[34] Should a foreign company wish to export types of seafood that carry a risk of harming marine mammals into the US, it must participate in a transparent certification process. Market access will be granted for seafood that is certified as coming with protections "comparable in effectiveness to US standards." The system includes transition timetables and technical assistance to impacted parties to help them adjust their domestic legislations to be granted market access. This is an interesting example of CES focused on production process requirements and highlights the importance of design to ensure compliance with the WTO and the necessity to consider how exporters can be assisted to respect the CES.

Another example is Thailand's codification into national law of its Good Agricultural Practices (GAP), a private standard that sets out best practices for agricultural production. In contrast to the previous example, Thailand chose to take an existing voluntary global standard as a starting point and enshrine it into law, a process known as "national benchmarking". GlobalG.A.P. has more than 700 certified products and over 200,000 certified producers in more than 135 countries.[35] To show that products come from appropriately certified production, importers must present evidence in the form of original certificates or copies of original certificates issued by the respective certification bodies. Specifically, since August 2019, a new regulation by Thailand's Food and Drug Administration (FDA) requires that all fresh produce destined for Thailand is certified in accordance with a GLOBALG.A.P. standard. This could either be national GAP standards, such as the Vietnamese VietGAP, the Cambodian CAMGAP, the Japanese JGAP, or the internationally recognised GLOBALG.A.P.[36]

There are CES that also concern regulations that target environmental harm exclusively in exporting countries. For example, as part of the Environment Act 2021, the UK adopted a Law on Forest Risk Commodities, which seeks to regulate the import of certain forest risk

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[32] See also DS381, *US – Tuna II (Mexico)*, one page case summary, available at: www.wto.org/english/tratop_e/dispu_e/cases_e/1pagesum_e/ds381sum_e.pdf.

[33] Institute for European Environmental Policy (IEEP) and TULIP (2021). Ibid.

[34] Waters, M. (2021), *The US MMPA model for building CES into Trade Policy-WWF Briefing*, available at: https://www.wwf.org.uk/sites/default/files/2021-03/MMPA%20Briefing%20final%20draft_0.pdf;

[35] GlobalG.A.P. (2020), *What We Do*, available at: https://www.globalgap.org/uk_en/what-we-do.

[36] GlobalG.A.P. (2019), *G.A.P. Certificate Now Required for All Fresh Produce Imported to Thailand*, available at: https://www.globalgap.org/uk_en/media-events/news/articles/G.A.P.-Certificate-now-Required-for-all-Fresh-Produce-Imported-to-Thailand-00001/.

commodities (FRCs) or products derived from FRCs in commercial activities in the UK.[37] While greater detail on implementation will be set out in secondary legislation, the law is likely to apply to commodities such as palm oil, soya, cocoa, rubber, beef and leather. As it is currently drafted, the law focuses on FRCs linked to illegal deforestation.[38]

Similarly, the European Commission has submitted a proposal to pass regulation to minimise EU-driven deforestation and forest degradation, which would go a step further than the current proposal on FRCs in the UK. Indeed, the Commission's 2021 proposal seeks to promote "deforestation-free" products, thereby "provid[ing] a guarantee to EU citizens that the products they consume on the EU market do not contribute to global deforestation and forest degradation."[39] Operators importing to the EU will face strict traceability obligations that will go beyond existing certification schemes. Similar to the UK's Law on FRCs, the legislation would focus on key commodities identified by the Commission as the main causes of deforestation: soy, beef, palm oil, wood, cocoa and coffee and their related products (e.g. leather, chocolate and furniture).[40] The legislation proposes to put in place a benchmarking (or traffic light) system operated by the Commission, which will identify countries as presenting a low, standard or high risk of producing commodities or products that are not deforestation-free, with corresponding levels of documentation to be presented by importers and monitoring mechanisms to be put in place.[41] Both the UK's Law on FRC and the EU's proposed deforestation-free value chain regulation seek to impose CES that address harm exclusively from exporting countries.

A scheme that seeks to create reciprocity in environmental standards and has received a great deal of attention is the European Commission's proposal to introduce the CBAM.[42] This measure aims to reduce the risk of "carbon leakage", i.e. the process whereby production of carbon-intensive products moves outside of the EU to areas with weaker climate regulation. Leakage will be mitigated by requiring exporters to the EU to pay a carbon price at the EU border equivalent to that faced by EU producers under the EU Emissions Trading Scheme (ETS). Such an arrangement has the benefit of providing an incentive to exporters to regulate their domestic sector and benefit from the carbon levy themselves. The proposed CBAM covers several high-emitting sectors such as cement, iron and steel but also mineral fertilisers containing two or three

[37] Covington (2021), *EU and UK: Due Diligence Obligations for Deforestation Risk Products*, available at: https://www.cov.com/en/news-and-insights/insights/2021/12/eu-and-uk-due-diligence-obligations-for-deforestation-risk-products.
[38] Ibid.
[39] Ibid.
[40] European Commission (2021), *Questions and Answers on New Rules for Deforestation-free Products*, available at: https://ec.europa.eu/commission/presscorner/detail/en/qanda_21_5919.
[41] Ibid.
[42] Experts have suggested that this mechanism is not suitable for food products. See e.g. Food Ethics Council (2001), *Food Policy on Trial: Carbon Border Adjustment tax and food systems*, available at: https://www.foodethicscouncil.org/app/uploads/2021/07/Food-Policy-on-Trial-on-CBA-Food-Ethics-Council-jurys-verdict-summary_FINAL-1.pdf

of the elements nitrogen, phosphorus and potassium.[43] In doing so, the EU seeks to level the playing field between domestic producers and producers abroad, while at the same time ensuring the effectiveness of the ETS by reducing the risk of carbon leakage.

Finally, under the French Presidency of the EU, discussions are turning to injecting "reciprocity" into the EU's trading terms for agri-food products by proposing that imported food and feed products are subject to the same sanitary, phytosanitary, animal welfare and environmental standards as those standards imposed on products and production in the EU.[44] The so-called "mirror clauses" proposal, and how it could translate into EU policymaking, is still under discussion. At the same time, as part of the EU's Farm to Fork strategy, the Commission has announced two pesticide reduction targets to be attained by 2030. Discussions are underway in the EU on how requirements for certain pesticides might be devised to create a level playing field between the EU and agricultural exporters, with the aim of enhancing the effectiveness of EU regulation.

In sum, the idea of adopting mandatory unilateral CES for agri-food products is part of an emerging pattern whereby countries seek to ensure that they reduce their contribution to environmental degradation in trading partners, and where countries seek to level competitive conditions in situations where there are divergences in regulations. With this in mind, the following sections focus on how these ideas can be translated into specific policy options.

[43] IEEP (n.d.), What Can Least Developed Countries and Other Climate Vulnerable Countries Expect from the EU Carbon Border Adjustment Mechanism (CBAM)?, available at: https://ieep.eu/uploads/articles/attachments/0f93d0de-8ac8-491f-9756-31fc93cba720/What%20can%20climate%20vulnerable%20countries%20expect%20from%20the%20EU%20CBAM%20-%20IEEP%20et%20al%20briefing%20(002).pdf?v=63791839851

[44] Rees, E. (2022). Ibid.

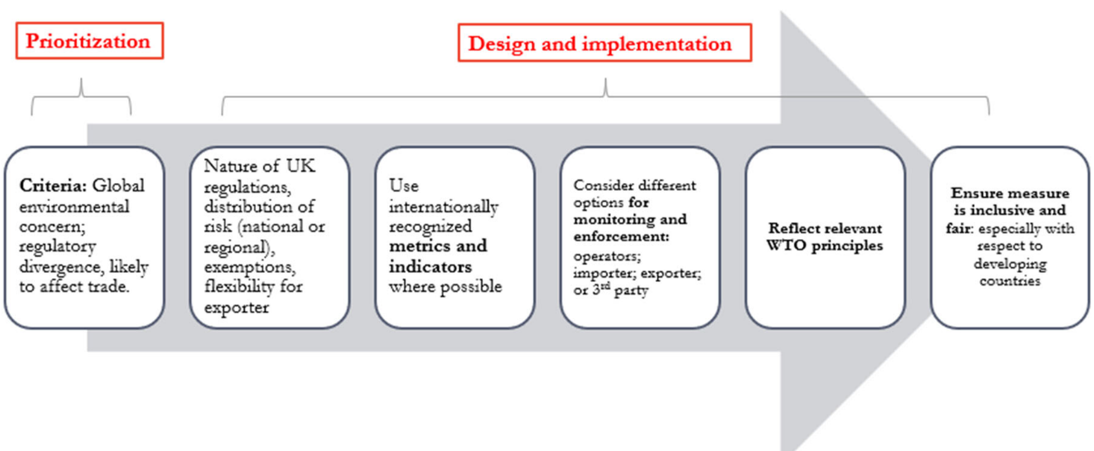
3. A methodological framework for developing CES

The development of CES for agri-food products is a comprehensive process that should follow the general principles of good policymaking, from the initial issue identification and agenda-setting, stakeholder consultations, the assessment of trade-offs and setting of priorities, to evaluating scientific evidence and, finally, developing an effective implementation, along with policy review, monitoring and evaluation process.

This section focuses on how to start developing CES for specific environmental issues. Going from identifying a problem towards developing a concrete CES applicable to imported agri-food products is a complex process requiring deliberation, prioritization, trade-offs, scientific evidence and judgement. Specifically, as set out in Figure 3 below, this would require identifying areas where CES are most needed; adopting design options that reflect legal and developing country considerations; and ensuring the process is collaborative, inclusive and fair, and that implementation takes place gradually.

After explaining the methodology, the next sections will apply the methodology to two case studies: the first focused on the neonicotinoid insecticides and the latter focused on nitrogen.

Figure 3. Overview of methodology to be applied in developing CES



3.1 Identify the areas where CES are most needed

When developing CES, it is important to identify the areas where CES would be most required and most effective. The intention is to find areas where a failure to impose similar standards on domestic and imported products means a lost opportunity to raise environmental standards associated with UK food consumption.[45] In identifying priority areas, regulators can take into account two criteria:

Criterion 1: Global Environmental relevance. The CES should focus on issues of high relevance for the global environment.

Criterion 2: Regulatory divergence and trade sensitivity. The CES should focus on measures that are most trade-sensitive, i.e. measures that are potentially most affected by trade and trade-related activities due to regulatory divergence and trade volumes.[46]

Criterion 1 is suggested to maximise impact with respect to minimising negative environmental impacts of food production. The food and agricultural sectors are associated with many aspects of environmental damage: biodiversity degradation/habitat destruction, water quality and management, soil health, air quality and climate change. CES should focus on issues of global environmental concern. Imposing CES for local environmental issues would neither lead to significant environmental gains nor be appropriate.[47] Areas that have been recognised as global environmental problems that are relevant for the agri-food sector include climate change (including e.g. global mean sea level rise), biodiversity loss, freshwater depletion and pollution, ocean acidification, and disrupted biogeochemical processes.

Criterion 2 focuses on the existence of a gap in environmental regulations affecting traded products. Relevant regulatory gaps would include cases where UK producers are held to a much higher standard of environmental protection than producers in exporting countries, and cases where the domestic standard imposes higher costs rendering them uncompetitive with exporters. A national standard may be considered trade-sensitive if it is at risk of being undermined *de facto* due to competitive pressures leading to higher imports of agri-food produced at a lower standard, or *de jure* if it risks being eroded should domestic producers pressurise government to level (down) the playing field. In addition, trade sensitivity could be present in situations where the UK has no domestic production but is reliant on imported products instead (e.g. cocoa and coffee production).

Demonstrating regulatory divergence and trade sensitivity may be data demanding. This is especially so if the regulatory framework is multi-layered (as it will be shown it often is for environment and land management), if it affects many products (as it often does), and if the products are widely traded (which is common for the most important agricultural commodities). Defining the regulatory requirements for agri-food in the UK at the present time is not straightforward. The UK is in a dynamic phase of setting standards for food and agriculture. Most of the legislation in the fields or environment, food, agriculture and trade were in EU

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[45] IEEP and TULIP (2022). Ibid.
[46] Baldock (2018).
[47] Spiller et al. discusses the issue of global versus local environmental concerns in trade in detail. (Spiller, A., Busch, G. and Tangermann, S. (2021), "Fair rules for sustainable German agriculture. Theses to ensure a level playing field in international competition", https://agrardebatten.de/agrarzukunft/faire-spielregeln-fuer-eine-nachhaltige-deutsche-landwirtschaft/.

regulations and directives. These were initially transposed into UK law by the European Union (Withdrawal) Act 2018. This provides the base line from which there is now a process, post-Brexit, of new policy evolution. Whilst trade policy is a UK competence, policy for environment and agriculture are devolved to the four administrations in England, Scotland, Wales and Northern Ireland. The primary legislation for environment and agriculture in England has been enacted, but the most important regulatory details are in the secondary legislation, which is slowly emerging. Likewise, the policies and standards in the other devolved administrations are under development. In this report, therefore, we take the status quo standards as the relevant ones. In addition to the challenge of defining the UK standard, assembling data on the corresponding standards in exporting countries may be somewhat demanding – this is especially the case where there are language differences. There may also be regional regulatory differences in some of the large exporting countries (e.g. the US and Brazil) and some understanding of the different agricultural systems and natural environment may be required to assess environmental impacts of agricultural regulation.[48]

For some areas such as pesticides, globally accepted and standardized indicators exist and data collection will be easier than for some other areas, such as climate-friendly agriculture, for which no single standardized indicator yet exists. Differences in farming systems give rise to many different potential metrics and verification systems. As policy measures can be highly context-specific and embedded in a more complex regulatory environment, comparative databases are rare. Moreover, major shortcomings in data availability of relevance to CES are the limited integration between different data sources and formats, the lack of integration between environmental and supply chain data and official trade statistics, as well as the limited granularity of existing data on environmental and supply chain impacts.

A number of initiatives have emerged to address data-related challenges, as further explained in Box 1 below.

[48] Ibid.

Box 1. Overview of innovative data analysis tools

One innovative tool is HESTIA (Harmonized Environmental Storage and Tracking of the Impacts of Agriculture), a platform for agri-environmental data that provides a standardized and structured format to represent information, which, upon widespread adoption, could unlock knowledge from the many currently incompatible data sources. The HESTIA website allows users to upload and download data on farming, food processing and other processes in the agri-food system, detailing the sustainability and productivity of different food products and production practices (hestia.earth).

Another highly relevant example is Trase, a data-driven transparency initiative that brings together disparate publicly available data to reveal linkages between the consumption of commodities and deforestation and biodiversity loss in places of production. This allows companies, governments and others to understand supply chain-related risks and identify opportunities for more sustainable production (Trase.earth, 2022).

Another noteworthy tool is The Global Farm Metric (GFM), which seeks to provide a common framework to assess whole farm sustainability. By assessing farm sustainability on 11 major outcome-based indicators, the GFM proposes an evidence-based sustainability monitoring approach applicable across farming systems and landscapes that is compatible with other frameworks. The tool, which has been driven by a broad coalition of stakeholders, is currently in its late development phase (Global Farm Metric, 2022).

3.2 Develop policy design options for CES

3.2.1 General design-related considerations

Once priority areas for CES have been identified, the next step is to design the CES. The design of the CES will necessarily depend on the environmental issue that the measure seeks to address and the nature of the corresponding regulatory framework. The approach chosen will differ depending on whether CES are designed for an issue where the regulations are binary (on/off; may use/may not use certain process or input), a quantitative approach (i.e. not exceeding a certain threshold), or they involve more qualitative management requirements. In addition, when dealing with an environmental situation where the risk is concentrated in certain areas and not in others, it would be important to tailor the CES to situations where the environmental risk is the highest. This, in turn, could involve defining variables or parameters enabling countries/areas to be designated as high, medium or low risk to engage in activities that aggravate the environmental issue of concern. Moreover, this would require thinking about whether the standard should focus on high-risk areas/countries only or also operate on a farm-level, i.e. approve products from farms that have demonstrated compliance with the CES to import into the UK through a licencing system. In the latter cases, procedures should be in place to ensure traceability and identity preservation through the food chain.

In the absence of internationally recognised and consistent indicators and metrics for a given environmental issue, regulators will need to evaluate what metrics and indicators should be used to describe the measure/standard and on what level (policy, practice or performance). By way of illustration, Table 1 and Table 2 below provide an overview of possible indicators for sustainable agriculture that can be used to address agricultural problems, as evaluated by the World Resource Institute.[49] It must be noted, however, that many of these are still very broad.

Table 1. Indicators for sustainable agriculture for water, climate change and land conversion[50]

	Water	Climate Change	Land Conversion
Policy	Existence of policies requiring measurement of agricultural water withdrawals (Yes/No)[b]	Existence of policies promoting low greenhouse gas (GHG) agricultural development (Yes/No)[b]	Existence of policies limiting conversion of natural ecosystems to agriculture (Yes/No)[b]
Practice	Share of irrigated cropland area with efficient irrigation practices in place (%)[a]	Share of farm area with agricultural GHG emissions management practices (%)[b]	(1) Share of agricultural land enrolled in agricultural preserve programmes (e.g. zoning to preserve production (%)[b] *and/or* Share of former agricultural land in conservation set-aside programme (%)[b]
Performance	(1) Crop production per unit of water withdrawn (kilograms of crop produced per cubic meter of water per year) *in combination with* (2) Water stress ratio (water demand/water supply in cubic meters)	Food production per unit of GHG emissions (tons of food produced per year per ton of CO2 equivalent)[b]	(1) Conversion of natural ecosystems (e.g. forests, wetland) to agricultural land (crop and pasture) (hectares of converted land per year)[a] *and/or* (2) Share of agricultural land over X years that was stable, share that shifted to natural land, share that shifted to natural land, and share that grew from natural land conversion (%)[a]

Table 2. Indicators for sustainable agriculture for soil health and pollution

	SOIL HEALTH	POLLUTION	
		NUTRIENTS	PESTICIDES
Policy	Existence of policies that promote agricultural soil conservation practices (Yes/No)[b]	Existence of policies promoting nutrient management practices (Yes/No)[b]	Actions to ban or restrict pesticides and toxic chemicals under the Stockholm Convention (25-point scale)[a, c]

[49] Reytar, K., Hanson, C. and Henninger, N. (2014), *Installment 6 of 'Creating a Sustainable Food Future', Indicators of Sustainable Agriculture: A Scoping Analysis*, available at: http://agri.ckcest.cn/file1/M00/0E/C8/Csgk0F14pySAJ3LZAAWPIzdRhtk633.pdf.
[50] Ibid.

	SOIL HEALTH	POLLUTION	
		NUTRIENTS	PESTICIDES
Practice	(1) Share of arable land under soil conservation practices (%)[a] *and/or* (2) Share of cropland under conservation agriculture (e.g. organic soil cover greater than 30% immediately after planting) (%)[a]	Share of agricultural land under nutrient management practices (%)[a]	Share of cropland under integrated pest management (%)[a]
Performance	(1) Share of agricultural land affected by soil erosion (%)[a] *And/or* (2) Percent change in net primary productivity (NPP) across agricultural land (%)[a] *And/or* (3) Soil organic matter (carbon) content (tons of carbon per hectare)[b]	(1) Nutrient input balance on agricultural land (i.e. difference between nitrogen [N] and phosphorus [P] inputs and outputs) (kilograms of N and P per hectare of agricultural land)[a] And/or (2) Fertilisers applied per unit of arable land (tons of nutrient per hectare of arable land)	Pesticide use per unit of cropland (tons of active ingredient applied per hectare)[a]

Notes:

[a] Indicators that would require new effort to achieve more comprehensive and comparable data coverage and to establish regular data collection.

[b] Indicators based on data that are currently unavailable, and would require new effort to design (e.g. develop a detailed definition and measurement protocol) and to establish regular data collection efforts.

[c] The unit of measure for the pesticides policy indicator is a 25-point scale that measures the in-country status of 11 of the original chemicals listed in the Stockholm Convention on Persistent Organic Pollutants (POPs). A country is assigned three points for ratifying the treaty, two points for each POPs chemical banned, and one point for each POPs chemical restricted. The target score is 25.

Other elements to think about in designing the CES include how to reflect exemptions from the regulatory obligations that have been accorded to UK producers. There can easily arise in situations where the normal good practice (and obligatory) codes may be relaxed because variation in natural conditions (e.g. floods, fires) prevent the operation of the practice. Is the response to automatically give the same set of exemptions to imported products, or to require the exporter to demonstrate the same *force majeure* explanation for not respecting the condition? How should different climates and characteristics be taken into account?

Other general considerations that must be taken into account in the design of CES include the importance of minimizing administrative costs and burdens. One way to do so would be to design the CES in a way to utilise existing certification, metrics and systems, including existing voluntary and market-led schemes as set out in section 2 above. This will reduce administration costs and ease the uptake of CES and, at the same time, reduce the creation of potential barriers to trade.

While not further examined in the context of this report, another important element in CES policy design relates to the approach chosen for monitoring, verification and enforcement of the standard. In other words, this requires establishing who will be in charge of enforcing the standard. This could be the trader or operator, as is the case in the EU's proposed new rules for deforestation-free products, or it could be done at the customs level, by inspections or through third-party verification systems (typically carried out in the exporting country). The exporting country also plays an important role in certification checks and clearing a product for export. Two countries can agree, for example through mutual recognition agreements and other trade instruments, to accept the testing and inspection carried out by the other country, thereby avoiding additional testing and inspection in the importing country. These options are further explored in Box 2 below.

Box 2. Overview of different types of enforcement

Enforcement at operation/trader level through due diligence: The proposed EU new rules for deforestation-free products are an example of a law where enforcement is in the hands of the operator/trader importing the product. Indeed, companies placing relevant commodities and products on the market will be required to put in place and implement due diligence systems to prevent the placing on the EU market of products linked to deforestation. These companies will be monitored and held accountable if they fail to comply with the regulations. When placing products on the market, companies must submit a due diligence statement to the relevant authorities providing essential information about the products, including the geographical coordinates of the farm and the plantation on which the commodities were grown.

Enforcement at the border through customs control: An example of an enforcement at the border through customs control is the EU pesticide regulation. To enter the EU single market, pesticides must be authorized by the European Food State Authority (EFSA) and the European Commission's Standing Committee on Plants, Animals Feed and Food. Without authorisation of a pesticide, no trace of the substance should be detectable when the food or feed enters the EU single market. To check imports for maximum residue limits (MRLs) of pesticides, as well as pests, EU Member States' food safety authorities team up with customs at border control posts. Additionally, EFSA also runs randomised MRL checks on food and feed consumed in the EU.

Enforcement through a third-party verification system: Standards may also be designed in such a way that the responsibility of enforcement and verification is entrusted to a private standardisation body. This is the case for Thailand's adoption of the GlobalG.A.P. standard, which has been explained earlier in Section 2.

In the context of enforcement, another important consideration concerns whether the CES should be designed in a way to facilitate border and/or farm checks. Procedures that address these issues have been developed more extensively in the context of SPS measures. At a country level, the SPS Agreement requires that exporting Members that claim that parts of their country are disease-free shall give "reasonable access" to the importing Member for inspection, testing and other relevant procedures.[51] With respect to farm-level verifications, some RTAs establish that, upon request by the importing party, the exporting party shall provide a list of establishments which comply with the importing party's requirements for approval and for which sanitary guarantees have been provided.[52] This would mean that enforcement and verification could take place without necessarily having to carry out inspection visits.

3.2.2 Reflecting relevant legal considerations in CES design

It is important to design CES in such a way that they comply with the general principles of international trade set out in WTO rules. Here, it is relevant, as highlighted in Section 2.2 above, that most CES will concern the process and production method (PPM) of an agri-food product. The general emphasis on PPMs in CES is a relevant factor to be taken into account in any WTO analysis. At the outset, it is worth noting that nothing in the WTO provisions or jurisprudence *ex ante* precludes differential treatment of products on the basis of PPMs. Whether or not a measure that sets out PPM requirements complies with the relevant WTO provisions depends on the design and application of the measure in question.

The most relevant agreements for the design of CES are the Agreement on Technical Barriers to Trade (TBT Agreement), the General Agreement on Tariffs and Trade 1994 (GATT) and the SPS Agreement. PPMs are generally considered to be covered under the GATT discrimination provisions set out in Articles I and III (GATT Article I applies to "all rules and formalities in connection with importation and exportation" and GATT Article III applies to "internal taxes and other internal charges, and laws, regulations and requirements affecting the internal sale, offering for sale, purchase, transportation, distribution or use of products, and internal quantitative regulations…)."[53] PPMs that require an agri-food product to meet domestic production standards can be considered a rule or formality connected to importation, as well as a law, regulation or requirement affecting, *inter alia*, the offering for sale of a product.

It is an unsettled matter whether PPMs that are not product-related (NPR PPMs), i.e. PPMs that do not alter a product physically (e.g. non-deforestation requirements for cocoa production), are subject to the provisions of the TBT Agreement. Indeed, the question is whether, to constitute a "technical regulation" under the TBT Agreement, the measure must have a physical connection to the product. While the conventional view is that NPR PPMs are not covered by the TBT Agreement, this is a question that has not been conclusively settled. However, for labelling requirements, the Appellate Body has found that these *are* covered under the scope of the TBT

[51] SPS Agreement, Article 7.
[52] See e.g. EU-Viet Nam FTA, Article 6.8.
[53] Depending on how the measure is designed, as well as its effect, it could potentially also be considered a quantitative restriction under Article XI. This paper does not focus on quantitative restrictions. However, if a claim was brought against CES on the basis of it being a quantitative restriction, the analysis would move to the exceptions clause under GATT Article XX, in which case considerations such as legitimate regulatory objective, trade-restrictiveness, necessity and extraterritoriality – all principles discussed in this paper – would also be relevant.

Agreement, even if the labelling requirements concern NPR PPMs.[54] While the scope of the TBT Agreement might be considered slightly less restrictive than the GATT[55], the implications of this are negligible, especially since a measure that has been found to comply with the TBT Agreement can still be analysed under the GATT.

The SPS Agreement could be relevant in situations where the CES can be framed as having the objective to "protect animal or plant health within the territory of the Member" from risks arising from disease, and from risks arising from additives, contaminants, toxins or disease-causing organisms in foods, beverages or feedstuffs. For example, it could be argued that a specific CES seeks to protect plant or animal life or health, and therefore falls within the scope of the SPS Agreement.

An important caveat, however, is that the SPS Agreement is geographically limited: it only covers measures that seek to protect animal, plant and/or human life or health *within the territory* from risks that arise from the entry, establishment or spread of pests, additives or contaminants, and diseases carried by animals or plants. By contrast, it does not cover measures that protect similar risks in third countries.[56] In other words, a trade-related measure that would seek to protect the UK territory from the decline of certain plant or animal varieties could fall under the scope of the SPS Agreement, but a measure that predominantly aims to protect a third country from the decline of a certain plant or animal species would not.

CES would subject imported agri-food products to environmental production standards similar to those applicable in the UK. The rationale for doing so is not the risks the imported agri-food products pose to UK animal, plant or human life or health. Rather, it is the environmental implications associated with the production of the imported agri-food products, which takes place in third countries. Even though, as will be further explained in the case studies below, many of these environmental implications have a global dimension for purposes of SPS coverage, this will likely not suffice to be considered a sanitary or phytosanitary measure under the definition set out in Annex A of the SPS Agreement. In sum, the two agreements most relevant to CES are the GATT and the TBT Agreement, which are the focus of this paper.

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[54] Appellate Body Report, *US – Tuna II (Mexico)*.
[55] Whether CES is examined under the GATT or TBT Agreement could make a difference, given that panels and the Appellate Body have not found an implied territorial requirement in the TBT Agreement and because it contains an open list of legitimate regulatory objectives on which trade-restrictive technical regulations can be based, compared to GATT Article XX, which sets out a closed list. (Lamy et al. (2022)).
[56] SPS Agreement, Annex I; Lamy et al. (2022).

Box 3. SPS versus TBT measures under the WTO

The SPS Agreement, which applies only to SPS measures, defines an "SPS measure" as follows: "Any measure applied: (a) to protect animal or plant life or health within the territory of the Member from risks arising from the entry, establishment or spread of pests, diseases, disease-carrying organisms or disease-causing organisms; (b) to protect human or animal life or health within the territory of the Member from risks arising from additives, contaminants, toxins or disease-causing organisms in foods, beverages or feedstuffs; (c) to protect human life or health within the territory of the Member from risks arising from diseases carried by animals, plants or products thereof, or from the entry, establishment or spread of pests; or (d) to prevent or limit other damage within the territory of the Member from the entry, establishment or spread of pests."

The TBT Agreement covers technical regulations, standards and conformity assessment procedures. For purposes of CES, the most relevant definition is "technical regulation". The TBT Agreement defines a "technical regulation" as: "A document which lays down product characteristics or their related processes and production methods, including the applicable administrative provisions, with which compliance is mandatory. It may also include or deal exclusively with terminology, symbols, packaging, marking or labelling requirements as they apply to a product, process or production method."

In sum, what distinguishes an SPS measure from a TBT measure is the objective. There can, however, be situations in which a measure can be considered both an SPS measure and a technical regulation.

The specific requirements for the design of CES depend on the measure at issue and the specific provisions that are triggered. While the precise wording of the relevant provisions under these agreements may vary, significant conceptual overlap exists between them. Therefore, this section has identified key elements of a common conceptual framework distilled from the TBT Agreement, the SPS Agreement and the GATT for policymakers to consider when designing CES.[57] Specifically, the identified principles are:[58]

[57] Specifically, these principles have been distilled from the requirements set out in GATT Articles I, III and XX; and TBT Agreement, Articles 2.1 and 2.2.

[58] The principles set out in this summary are distilled from the provisions of the General Agreement on Tariffs and Trade (GATT), the Technical Barriers to Trade (TBT) Agreement and the Sanitary and Phytosanitary (SPS) Agreement. They combine elements that establish violations of GATT/TBT/SPS provisions, such as non-discrimination, with elements that must be present in order to justify such discrimination under GATT Article XX. Please note that the purpose of this section is to get an understanding of the legal considerations to take into account when designing CES; not to provide a provision-by-provision legal analysis.

- **Non-discrimination:** When products are considered to be "like", the CES cannot unjustifiably or arbitrarily discriminate between its trading partners, or between its own and foreign products.
- **Legitimate regulatory objective:** The CES should be designed to achieve a legitimate regulatory objective.
- **Extraterritoriality:** There must be a "sufficient nexus" between the legitimate regulatory objective the CES seeks to advance and the UK.
- **Even-handedness:** The CES should consider flexibility to allow for different conditions and characteristics in the exporting countries.
- **Trade-restrictiveness**: The CES should not be more restrictive than necessary to achieve the regulatory objective at the level of risk-protection that is chosen by the importing country.
- **Sufficient scientific evidence**: It will be difficult to justify CES if they are not based on sufficient scientific evidence.
- **Relevant international standards**: The TBT and SPS Agreements put a premium on complying with the relevant international standard. This will be less relevant for the CES analysis, given the lack of internationally accepted CES for agri-food products.

The sections below provide further information about these key principles.

Non-discrimination

The principle of non-discrimination is a cornerstone of the WTO. It is, *inter alia*, a requirement under Articles 2.3 and 5.1 of the SPS Agreement, Article 2.1 of the TBT Agreement and Articles I and III of the GATT. Generally speaking, the principle of non-discrimination requires that a Member shall not discriminate between "like" products from different trading partners, and between its own and "like" foreign products.[59] To find that products are "like", panels have traditionally looked at four factors: classification, physical qualities, end uses and consumer tastes and habits.[60] With respect to consumer preferences, panels have looked at substitutability between the two products at issue – with low degrees of substitutability to be used as factors to establish that products are non-"like". If products are not considered "like", it ends the discrimination analysis.

In the context of CES, an important consideration is whether the measure sets out a process and production method (PPM). In situations where there is no physical difference between products that have been differently produced (NPR PPMs), it will be more difficult to establish that products are not "like" compared to a situation where the PPM does change the physical product. For example, deforestation-free requirements tend not to have any physical effects on a product, which would make it difficult to establish that cocoa with high-deforestation footprints is not "like" cocoa with a low-deforestation footprint. It would be relatively easy to establish that

[59] GATT Articles I and III.

[60] See e.g. Appellate Body Report, *Japan – Alcoholic Beverages II*. See also Panel Report, *US – Gasoline*, para. 6.8.

products are not "like", for example, where a physical residue can be detected in a product as a result of the PPM applied.

If products are seen as being "like", an analysis of the WTO-inconsistency of the measure would need to focus on the discrimination and/or less favourable treatment that results from the measure. Discrimination can be either *de jure* – where it results from the way the measure is designed – or *de facto* – where the application of the measure results in discrimination because "a measure modifies the conditions of competition between like imported products to the detriment of the third-country imported products at issue."[61]

Legitimate regulatory objective

A number of relevant WTO provisions focus on the link between the objective of the measure and trade-restrictiveness. Specifically, this is relevant to establish justifications to what otherwise can be discriminatory measures.

Under the TBT Agreement, discrimination can be justified if the CES is "not more trade-restrictive than necessary" to achieve "a legitimate regulatory objective". Article 2.2 of the TBT Agreement lists as a legitimate regulatory objective the protection of animal life or health, the protection of plant health, and the protection of the environment (although this is an open list). Thus, in order to justify discriminatory treatment – or other GATT-inconsistent measures – the legitimate regulatory objective is critical.

A number of policies have been found to fall within these exceptions, including policies aimed to protect dolphins, reduce risk to human health imposed by asbestos, reduce risk to human, animal and plant life or health arising from the accumulation of waste tyres, and policies aimed at the conservation of tuna, salmon, herring, dolphins, turtles and clean air.[62]

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[61] Appellate Body Report, *EC – Seal Products*, paras 5.90/5.115.

[62] WTO rules and environmental policies: GATT exceptions, available at: https://www.wto.org/english/tratop_e/envir_e/envt_rules_exceptions_e.htm.

Box 4. Text of General Exceptions, GATT Article XX

Subject to the requirement that such measures are not applied in a manner which would constitute a means of arbitrary or unjustifiable discrimination between countries where the same conditions prevail, or a disguised restriction on international trade, nothing in this Agreement shall be construed to prevent the adoption or enforcement by any contracting party of measures:

(a) necessary to protect public morals;

(b) necessary to protect human, animal or plant life or health;

(c) relating to the importations or exportations of gold or silver;

(d) necessary to secure compliance with laws or regulations which are not inconsistent with the provisions of this Agreement, including those relating to customs enforcement, the enforcement of monopolies operated under paragraph 4 of Article II and Article XVII, the protection of patents, trademarks and copyrights, and the prevention of deceptive practices;

(e) relating to the products of prison labour;

(f) imposed for the protection of national treasures of artistic, historic or archaeological value;

(g) relating to the conservation of exhaustible natural resources if such measures are made effective in conjunction with restrictions on domestic production or consumption;

(h) undertaken in pursuance of obligations under any intergovernmental commodity agreement which conforms to criteria submitted to the [Members] and not disapproved by them or which is itself so submitted and not so disapproved;

(i) involving restrictions on exports of domestic materials necessary to ensure essential quantities of such materials to a domestic processing industry during periods when the domestic price of such materials is held below the world price as part of a governmental stabilization plan; Provided that such restrictions shall not operate to increase the exports of or the protection afforded to such domestic industry, and shall not depart from the provisions of this Agreement relating to non-discrimination;

(j) essential to the acquisition or distribution of products in general or local short supply; Provided that any such measures shall be consistent with the principle that all contracting parties are entitled to an equitable share of the international supply of such products, and that any such measures, which are inconsistent with the other provisions of the Agreement shall be discontinued as soon as the conditions giving rise to them have ceased to exist. The [Members] shall review the need for this sub-paragraph not later than 30 June 1960.

To be eligible for an exception under GATT Article XX, it is also important to establish the degree between the stated environmental objective and the measure at issue. This is further discussed under the heading 'Trade-restrictiveness' below.

Extraterritoriality

In framing the objective of the measure, it is important to address concerns related to extraterritoriality raised in the context of GATT Article XX in previous WTO cases with an environmental dimension, including *US – Shrimp*, *US – Tuna II (Mexico)* and *EC – Seal Products.* While the jurisprudence is inconclusive[63] as to whether there is an implied extraterritoriality requirement in the subparagraphs of GATT Article XX, a panel will most certainly analyse, in this context, whether a "sufficient nexus" exists between the objective of the measure and the country's territory. In *US – Shrimp*, a case which concerned a US ban on shrimp from countries which had not used turtle-friendly fishing nets, the Appellate Body found such nexus to exist, given that turtles are a highly migratory species.

The extraterritorial requirement can also be satisfied by focusing on the "public morals" exception under Article XX, an approach that was adopted in *EC – Seal Products*. This case concerned an EU ban on seals and seal products, with certain exemptions that, it was argued, violated the GATT. The US claimed that the violations were justified under GATT Article XX(a) as they were "necessary to protect public morals". The Appellate Body found the combined factors of seal welfare, concerns of EU citizens and consumers, and the fact that the measures were addressing seal-hunting activities both within and outside the EU, evidence of a sufficient nexus.[64]

Even-handedness

Having discussed legitimate regulatory objective and extraterritoriality, this section takes us back to the issue of discrimination. Under TBT Article 2.1 and GATT Article XX chapeau, the WTO rules allow for discrimination to exist if it stems exclusively from a legitimate regulatory distinction. For this, previous cases have looked at the measure's "even-handedness", i.e. whether the measure is designed and applied in an even-handed manner or is designed and applied such that it constitutes arbitrary or unjustifiable discrimination.[65]

Existing case law also indicates that one factor to look at when assessing whether the application of a measure constitutes unjustifiable or arbitrary discrimination is to examine whether the measure leaves room to assess conditions in relevant exporting countries. In examining whether discrimination was arbitrary or unjustifiable under Article XX, the Appellate Body in *US – Shrimp*

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[63] This issue was first raised in the context of the well-known *US – Tuna (II) Mexico* dispute, which concerned a US import ban on tuna caught by suppliers in countries listed as failing to require the use of dolphin-friendly nets. This led to questions from the European Communities and the Netherlands as to whether the measure could be defended under GATT Article XX. The panel noted that the GATT did not "proscribe…in an absolute manner measures taken with respect to things located or actions occurring outside the territorial jurisdiction of the party taking the measure". However, it also found that "measures taken so as to force other countries to change their policies, and that were effective only if such changes occurred, could not be considered "necessary" for the protection of animal life or health under Article XX(B)." The last part of this finding was later overturned by the Appellate Body in the *US – Shrimp* case. In its analysis, the Appellate Body focused on whether a "sufficient nexus" existed between objective of the measure and the country's territory.

[64] Dobson, N.L. (2017), "The EU's conditioning of the 'extraterritorial' carbon footprint: A call for an integrated approach in trade law discourse", *Review of European, Comparative & International Environmental Law,* 27(1), 75-89, available at: https://doi.org/10.1111/reel.12226.

[65] See e.g. Appellate Body Report, *US – COOL,* para. 340.

explained that "discrimination results not only when countries in which the same conditions prevail are differently treated, but also when the application of the measure at issue does not allow for any inquiry into the appropriateness of the regulatory program for the conditions prevailing in those exporting countries."[66]

Similarly, in the context of TBT Article 2.1, the Appellate Body in *US – Clove Cigarettes* notes that a panel must analyse whether any detrimental impact on imports stems exclusively from a regulatory distinction: "a panel must carefully scrutinize the particular circumstances of the case, that is, the design, architecture, revealing structure, operation, and application of the technical regulation at issue, and, in particular, whether that technical regulation is even-handed."[67] Applying these criteria, the Appellate Body in *US – Tuna II (Mexico)* stated that "it will scrutinize, in particular, whether ... the US measure is even-handed in the manner in which it addresses the risks to dolphins arising from different fishing methods in different areas of the ocean."[68] In assessing the even-handedness of the measure at issue, the Appellate Body looked at whether access to the dolphin-safe label was "'calibrated' to the risks to dolphins arising from different fishing methods in different areas of the ocean."[69]

Trade-restrictiveness

Another element of WTO-consistency concerns the CES' trade-restrictiveness. This relates to the fact that the WTO seeks to balance a country's right to regulate, on the one hand, with trade liberalization, on the other hand. The requirement that a measure is not more trade-restrictive than necessary is set out in the TBT Agreement and is also reflected in GATT Article XX. In making this analysis, panels and the Appellate Body have considered a number of different factors, including: (i) the degree of contribution made by the measure to the legitimate objective at issue; (ii) the trade-restrictiveness of the measure; and (iii) the importance of the value or interest sought to be protected. In most cases, a panel would compare the challenged measure with possible alternative measures and analyse whether the alternative measure is less trade-restrictive while achieving the same objective. To understand the degree of contribution the measure makes to the objective, panels may look at risk assessments and other types of technical and scientific evidence underlying the measure.

Scientific basis of the measure

The scientific basis of the measure will also be relevant, including in an analysis as to whether a measure is not more trade-restrictive than necessary to fulfil the regulatory objective – both under the TBT Agreement and the GATT.[70] For example, in analysing the degree of contribution the measure makes to its objective, panels tend to look at risk assessments and other types of

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[66] Appellate Body Report, *US – Shrimp*, paras. 164-165.
[67] Appellate Body Report, *US – Clove Cigarettes*, para. 182.
[68] Appellate Body Report, *US – Tuna II (Mexico)*, para. 232 (referring to Appellate Body Report, *US – Clove Cigarettes*, para. 182).
[69] Appellate Body Report, *US – Tuna II (Mexico)*, para. 297.
[70] For purposes of the case studies in this report, the scientific basis of the measure is analysed as part of the trade-restrictiveness analysis.

technical and scientific evidence underlying the measure. Ensuring the measure is based on science is also a cornerstone of the SPS Agreement. Members can do so either by conforming their measure to the relevant international standard, or by basing the measure on a risk assessment. It is important to note, however, that no internationally accepted environmental standards exist for agri-food products.

3.2.3 Adopt an inclusive and fair design and implementation process

Another critical element that must be addressed when designing the CES concerns the impacts on third countries, in particular, developing countries. Different climate, soil and weather conditions apply, which may make it more difficult for them to comply with CES developed from legislation to address a UK environmental issue. Depending on the specific environmental issue that is being addressed, developing country considerations can be addressed, for example, by building in exception provisions, where warranted, and by providing for various types of technical assistance. These issues are further developed in Section 5.3 below.

There are various other ways in which CES can be made inclusive, including by organizing stakeholder feedback events, as well as by soliciting feedback online by opening up a draft CES for comments. This is a common practice adopted by the UK. Another key part of developing a fair implementation process relates to the transition time between adoption and enforcement of a policy measure. When significant changes are being required of farmers, it is critical they have adequate time to adjust their protection methods so that they can comply with the CES – it would be unreasonable to expect producers in exporting countries to adapt their practices faster than required for farmers in the UK.

Moreover, what would be important in the implementation phase is that the CES and the corresponding domestic measure will be implemented and enforced with the same degree. If the UK were to adopt more stringent enforcement procedures for the CES than applies to imported products compared to the regulation applicable to domestic products, the implementation process would not be fair.

4. Case studies

4.1 Case study 1: the case for CES for neonicotinoids

4.1.1 Introduction

This case study explores the development of a CES for neonicotinoid insecticides, a sub-group group of pesticides. In doing so, it demonstrates the importance of moving towards CES on issues of environmental concern where the UK's regulatory regime is more stringent on UK agricultural production compared to key importing countries. The following sections will explain the environmental concern raised by the use of neonicotinoids, namely, their damaging effect on bee populations and the relevant regulatory framework set out in the UK to regulate neonicotinoids. Three options for the design of a core environmental standard are defined, followed by an analysis of how to best incorporate key WTO principles in the design of CES.

4.1.2 The environmental issue of concern

Over the last seven decades, pesticides have become a vital element of crop protection in conventional agriculture. Coupled with developments in plant breeding and mechanisation, pesticides are seen by conventional farmers as ensuring more reliable and higher yields of more consistent crops. However, widespread application of pesticides has been demonstrated to have a number of negative environmental impacts, including, but not limited to, surface and groundwater contamination, soil contamination, diminishing soil fertility, contamination of air, soil and non-target vegetation as well as harming non-target animal and plant species and other organisms.[71] Generally, pesticide use has altered food sources and habitats for many organisms, causing population declines, rendering habitats for certain species unliveable, and posing long-term health risks such as endocrine disruption to mammals, birds, amphibians and fish as they accumulate in the food chain.[72] Insect and bird population declines have been linked to pesticide poisoning along with a reduction in the number of weeds that are an essential food source. Non-target mammal species such as dogs and foxes have also experienced "secondary poisoning"

[71] Aktar, M.W., Sengupta, D. and Chowdhury, A. (2009), "Impact of pesticides use in agriculture: their benefits and hazards", *Interdisciplinary Toxicology*, 2(1), 1-12, available at: https://doi.org/10.2478/v10102-009-0001-7 /.

[72] Isenring, R. (2015), *Pesticides and the loss of biodiversity*, available at: https://www.pan-europe.info/issues/pesticides-and-loss-biodiversity.

through ingestion of rats and mice poisoned by rodenticides (pesticides that kill rodents).[73] Insecticides are generally considered to be the most acutely toxic class of pesticides.[74]

Developed in the 1980s and 1990s, neonicotinoids are the most widely used class of insecticide worldwide, making up 40% of the global market.[75] They are used against attacks on crop plants by sap-sucking insects such as aphids. Neonicotinoids are approved in more than 120 countries, and are used as treatment in over 140 crops, including maize, cotton, oilseeds, sugar and cereals, among others.[76] As the use of neonicotinoids worldwide has become more widespread, concerns have been raised about their impacts on non-target insects especially pollinators and, in particular, bees. This coincides with observation of the emergence of the phenomenon of bee colony collapse in many countries, which has caused great alarm. Bee species are considered to be the most important and efficient pollinators.[77] The FAO estimates that, of 100 crop species that provide 90% of food worldwide, 71 species are pollinated by bees.[78] Thus, the decline in bee populations could have serious implications for crop production and consumption.

The decline of pollination could also lead to the extinction of local plant species dependent on pollination.[79] The loss of wild plants, in turn, could lead to negative impacts on multiple trophic levels and on other ecosystem services that plant communities provide such as soil health, nutrient cycling, water quality and pest regulation.[80] A much-quoted report based on a longitudinal study by Hallman et al. (2017) found a 75% decline over 27 years in flying insect biomass in protected areas in Germany.[81] There have been corresponding declines in farmland bird populations for which declining insects is one of several farming-related causal factors. While yield quantity is greatly impacted by pollinator declines so indeed is yield quality. For example, insect pollination has been demonstrated to enhance the fruit quality and economic value in UK apples as well as their quantity.[82] Other studies have also demonstrated the link between pollinators and yield quality, such as in California where the fat and vitamin E

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[73] Ibid.

[74] Aktar et al. (2009). Ibid.

[75] Van der Sluijs (2021), *Neonicotinoids in a post-Brexit UK*, available at: https://greenworld.org.uk/article/neonicotinoids-post-brexit-uk.

[76] Bakker, L., Werf, W. van der, Tittonell, P., Wyckhuys, K. and Bianchi, F. (2020), "Neonicotinoids in global agriculture: evidence for a new pesticide treadmill?", *Ecology and Society*, 25(3), available at: https://doi.org/10.5751/ES-11814-250326.

[77] European Academies Science Advisory Council (EASAC) (ed.) (2015), Ecosystem services, agriculture and neonicotinoids, EASAC policy report, available at: https://easac.eu/publications/details/ecosystem-services-agriculture-and-neonicotinoids/.

[78] European Food Safety Authority (EFSA) (n.d.), *Bee health*, available at: https://www.efsa.europa.eu/en/topics/topic/bee-health.

[79] EASAC (ed.) (2015). Ibid.

[80] Ibid.

[81] Hallmann, C.A., Sorg, M., Jongejans, E., Siepel, H., Hofland, N., Schwan, H., Stenmans, W., Müller, A., Sumser, H., Hörren, T., Goulson, D. and de Kroon, H. (2017), "More than 75 percent decline over 27 years in total flying insect biomass in protected areas", *PLOS ONE*, 12(10), available at: https://doi.org/10.1371/journal.pone.0185809.

[82] Ibid.

composition of almonds was highly influenced by pollination.[83] Additionally, ecosystem services provided by pest predators have been seen to increase the quantity and quality of coffee yields.[84]

Neonicotinoids have been demonstrated to be over 7,000 times more toxic to bees than dichlorodiphenyltrichloroethane (DDT), which was one of the first chemical insecticides used.[85] Neonicotinoids are systemic, which means that once taken up by the plant, whether by contact with the developing roots when used as a seed treatment or by foliar spray, the active substance is translocated throughout the plant (i.e. the roots, stem and flowers, including pollen and nectar). Neonicotinoids affect the central nervous system of insects, leading to paralysis, disturbing flight and navigation behaviour, resulting in bees getting lost and weakening the entire bee colony.[86] This, in turn, often leads to the death of bee populations. They are more toxic to invertebrates, including insects, than they are to mammals, birds and other higher organisms.[87]

There has been considerable controversy about the primary contributing factors to bee population decline, in particular, the extent to which pesticides were responsible. As public concern about the role of neonicotinoids in the decline of bee populations gained momentum, the European Commission asked the European Food Safety Authority (EFSA) in 2012 to "investigate the safety of three neonicotinoids with regard to bees in the light of new scientific and technical knowledge and monitoring data."88 The risk assessment carried out by EFSA concluded that neonicotinoids had harmful effects on bees, noting that "[a] high acute risk to honeybees was identified from exposure via dust drift for the seed treatment uses in maize, oilseed rape and cereals. A high acute risk was also identified from exposure via residues in nectar and/or pollen for the uses in oilseed rape."89 This assessment formed the basis for a precautionary ban on the use of three neonicotinoids in flowering crops, as will be further explained below.

An updated risk assessment published by EFSA in February 2018 confirmed that most uses of neonicotinoid pesticides represent a risk to wild bees and honeybees.[90] While, as illustrated in

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[83] Brittain, C., Kremen, C., Garber, A. and Klein, A.-M. (2014), "Pollination and Plant Resources Change the Nutritional Quality of Almonds for Human Health", *PLOS ONE*, 9(2), available at: https://doi.org/10.1371/journal.pone.0090082.
[84] Klatt et al. (2014), "Bee pollination improves crop quality, shelf life and commercial value", *Proceedings of the Royal Society B: Biological Sciences,* 281(1775), available at: https://doi.org/10.1098/rspb.2013.2440.
[85] Van der Sluijs (2021), p. 14. Ibid.
[86] Ibid.
[87] This summary was compiled from the EU Commission factsheet on neonicotinoids, available at: https://ec.europa.eu/food/plants/pesticides/approval-active-substances/renewal-approval/neonicotinoids_en.
[88] EFSA (2018), "Conclusion on the peer review of the pesticide risk assessment for bees for the active substance clothianidin considering the uses as seed treatments and granules", *EFSA Journal 2018*, 16(2), p. 86, available at: https://doi.org/10.2903/j.efsa.2018.5177.
[89] Ibid.
[90] EFSA (2018), *Neonicotinoids: risks to bees confirmed*, available at: https://www.efsa.europa.eu/en/press/news/180228.

Figure 4 below, risk varied depending on the intended use of the pesticide, bee species and route of exposure, for all outdoor uses at least one aspect of the assessment indicated a high risk. This lead EFSA to conclude that "overall" the analysed neonicotinoids represent a risk to bees.

Figure 4. Overview of levels of risk of the neonicotinoid imidacloprid[91]

Neonicotinoid	Type of bee	Crop	Route of exposure	Risk
Imidacloprid	Honeybees	Oilseed rape (winter and spring)	Residues in nectar and pollen from treated crop	Low
Imidacloprid	Honeybees	Oilseed rape (winter and spring)	Residues via dust drift	High
Imidacloprid	Bumblebees	Oilseed rape (winter and spring)	Residues in nectar and pollen from treated crop	High

The 2018 EFSA report further found that the soil in which the crop is planted can become contaminated with the pesticide. In some situations, the pesticide may persist and accumulate in the soil. These residues end up in the pollen and nectar of newly grown plants. EFSA concluded that, in some cases, bees might still be exposed to harmful levels of neonicotinoids pesticides through this route.[92] Additional scientific studies likewise find links between the use of neonicotinoids and bee health and behaviour.[93]

In sum, the link between neonicotinoids and their harm on bee populations has been found in the EFSA risk assessments, as well as other studies. This is the scientific basis on which the EU adopted restrictions on the use of neonicotinoids.

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[91] Ibid.

[92] Ibid.

[93] See e.g. Woodcock et al. (2017), which used large field experiments to assess the effects of crop treatment with clothianidin or thiamethoxam on honeybees and wild bees in Germany, Hungary and the UK and found that, following exposure, neonicotinoids reduced bee species' capacity to establish new populations. Baron et al. (2017) conducted a study examining the effects of field-relevant doses of thiamethoxam on wild queens of four bumble species. The study found that two weeks of exposure led to a reduction in feeding in two out of four species, and evidence of effectives on ovary development. Klein et al. (2017) found that "even at low intensity levels, many stressors damage the bee brain, disrupting key cognitive functions needed for effective foraging, with dramatic consequences for brood development and colony survival". LaLone et al. (2017) concluded that "sufficient biological plausibility exists to link activation of [nicotinic acetylcholine receptors by neonicotinoids] to colony death". Schick et al. (2017) found that data in a 2013 study of thiamethoxam funded by Syngenta, which had concluded that there was no evidence of detrimental effects and so thiamethoxam posed a "low risk" to bees, had not been sufficiently analysed and were therefore misleading and unacceptable. A study by researchers from UC Davis (2021), which found that bees exposed as larvae and adults had 44% fewer offspring and bees exposed in first and second years had 72% lower population growth rate.

4.1.3 The domestic environmental standards and policy measures in place

This section explains the regulatory framework in the UK for neonicotinoids. It comprises three ex-EU regulations: the pesticide approvals regulation, the regulation on Maximum Residue Limits (MRLs), and the Sustainable Use of Pesticides Directive (SUD). Understanding the features of each is important for the development of CES for neonicotinoids. All three regulations have been transposed into UK law through the European Union (Withdrawal) Act 2018. It must be noted, however, that the precise future and administration of pesticide approvals and related regulatory matters under the UK's devolved administrations are still under discussion.

EU pesticide approvals regulation

In the EU, active substances in pesticides are approved based on a precautionary hazard-based approach set out in Regulation No 1107/2009.[94] Specifically, it disallows the use of pesticides unless it has been demonstrated that the pesticide is not harmful.[95] By 2013, five neonicotinoid insecticides had been approved as active substances in the EU: clothianidin, imidacloprid, thiamethoxam, acetamiprid and thiacloprid. Following the risk assessment by EFSA in 2013, the EU severely restricted the use of plant protection products and treated seeds containing three neonicotinoids (clothianidin, imidacloprid and thiamethoxam) to protect honeybees.[96] Exceptions were granted for the use in greenhouses, treatment of crops after flowering, and winter cereals. In 2017, following the collection of additional data, the European Commission sought to ban the outdoor use of the three active substances.

Together with eight other EU Member States, the UK voted against the 2013 restrictions in neonicotinoids, although they were adopted by a majority decision. Objections to the restrictions on neonicotinoids from farmers and the pesticide industry in the UK pointed to the lack of direct evidence from field studies of long-term effects of neonicotinoids on bee populations. At the same time, farmers complained that a high percentage of their crops failed because of pest damage.[97] They further pointed to the fact that cereals and sugar beet are non-flowering crops so

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[94] Council Regulation (EC) No 1107/2009 of the European Parliament and of the Council of 21 October 2009 Concerning the Placing of Plant Protection Products on the Market and Repealing Council Directives 79/117/EEC and 91/414/EEC, OJ L 309/1, 24 November 2009, pp. 1-50.
[95] Epstein, Y., Chapron, G. and Verheggen, F. (2022), "What is an emergency? Neonicotinoids and emergency situations in plant protection in the EU", *Ambio*, V(I), available at: https://link.springer.com/article/10.1007/s13280-022-01703-5.
[96] Commission Implementation Regulation (EU) No 485/2013.
[97] This account was summarised by Black (2018).

pose lower risks to pollinators, that much of these products are applied as seed dressing and thus away from flying insects, the lack of effective alternatives to deal with the target insect pests, the negative economic impacts arising from expected yield reductions, and the higher risks in arable farming. This applied especially to cereals, oilseeds and sugar beet.

However, by November 2017, the UK Government changed their assessment of the harm done by neonics, given the new evidence on their impact on landscapes and the accelerated decline in pollinator populations. The Environment Secretary at the time, Michael Gove, highlighted that the evidence of harm from neonicotinoids had grown stronger since 2013, following the landmark field trial conducted by Woodcock et al. in 2017 and a global analysis of honey that had revealed worldwide contamination.[98] Specifically, he noted that "[t]he weight of evidence now shows the risks neonicotinoids pose to our environment, particularly to the bees and other pollinators which play such a key part in our £100bn food industry, is greater than previously understood."

Meanwhile, on the basis of the risk assessment carried out by EFSA in 2018, the EU restricted all outdoor use of the three neonicotinoids (clothianidin, imidacloprid and thiamethoxam), with permanent greenhouses being the only exception. Following these restrictions, the manufacturers of clothianidin, imidacloprid and thiamethoxam withdrew their applications for renewal of approval. In addition, approval for thiacloprid was withdrawn, based on a 2019 EFSA report.[99] Thus, formally speaking, these products have not been banned in the UK; rather, they have been removed from the list of approved active substances. For acetamiprid, the EFSA risk assessment established a low risk to bees, which was insufficient to justify restrictions.

Since restrictions have been imposed, several EU Member States have repeatedly made use of the possibility of emergency authorisations. These enable Member States to authorise, for a limited period of time, plant protection products "where such a measure appears necessary because of a danger which cannot be contained by another reasonable means".[100] Between 2013-2019, 206 emergency authorisations were granted for the use of three neonicotinoids (imidacloprid, thiamethoxam and clothianidin).[101] In 2020 and 2021, the EFSA reviewed 17 emergency authorisations in 11 EU Member States – all for neonicotinoid use on sugar beet. EFSA concluded that in all 17 cases the emergency authorisations were justified, either because no alternative products or methods (chemical or non-chemical) were available, or because there was a risk that the pest could become resistant to available alternative products. As further explained in Box 5 below, the UK approved emergency authorisation for neonic use on sugar beet in 2021 and 2022.

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[98] Carrington, D. (2017), *UK will back total ban on bee-harming pesticides, Michael Gove reveals*, The Guardian, 9 November 2017, available at: https://www.theguardian.com/environment/2017/nov/09/uk-will-back-total-ban-on-bee-harming-pesticides-michael-gove-reveals.

[99] European Commission (n.d.), *Neonicotinoids*, available at: https://ec.europa.eu/food/plants/pesticides/approval-active-substances/renewal-approval/neonicotinoids_en.

[100] Article 53 of the Approval Regulation (No 1107/2009).

[101] Foundation Nicols Hulot, Institut Vbelen (2021), *How can we stop the import of food produced using banned practices in Europe*, available at: https://www.veblen-institute.org/IMG/pdf/report_globalisationv4.pdf

Box 5. Emergency authorisation for sugar beet in the UK

Emergency authorisation was activated in the UK for sugar beet production in 2021 and again in 2022. The January 2022 decision recognised special circumstances where "limited and controlled use [of thiamethoxam as a seed treatment] appears necessary because of a danger that cannot be contained by any other reasonable means". The danger was the spreading of beet yellows virus by aphids. The criteria applied to allow this were as follows: first there must be special circumstances that make it appropriate to derogate from the standard approach to authorisations; there must be a danger demonstrated and the danger must not be capable of being contained by any other reasonable means. An emergency authorisation must appear necessary because of that danger, and an emergency authorisation may allow only limited and controlled use of the plant protection product.

The UK decision offers justifications under each of these five headings. The danger was evidenced by the loss of sugar beet production in 2020 and its economic impact when neonicotinoids were banned. These losses resulted from a bad infestation of beet yellows virus. The authorisation specified a threshold disease incidence risk and considered the alternative short-term and longer-term ways of dealing with the risk. The authorisation was granted with restrictions including a reduced application rate and a maximum drilling rate for the crop. Sugar beet is only grown in four counties (near processing factories) and the crop is harvested before it flowers so bees do not forage in the crop, although they can forage on weed flowers in field margins and pesticide residues may also be present in the soil. For this reason, further restrictions were applied: only non-flowering crops were to be planted within 32 months of the sugar beet crop; no further use of thiamethoxam seed treatments was allowed on the same field within 46 months; plus industry-recommended herbicide programmes to minimise flowering weeds and reduce the risk of indirect exposure of pollinators.

The narrative above summarises how it became established that neonicotinoids have an unacceptable environmental impact. It illustrates the lengthy path followed in the EU and the UK to establish a clear environmental standard to protect one aspect of biodiversity, namely, pollinator protection. By virtue of the restrictions imposed on outdoors use and the non-approval of neonicotinoids, this standard is now in place.

EU Maximum Residue Limits (MRLs) Regulation

The MRL regulation does not define specific goals.[102] The recitals make it clear that (as with Regulation No 1107/2009) the purpose of the regulation was partly to harmonise controls on

[102] Buckwell, A., De Wachter, E., Nadeu, E. and Williams, A. (2020), *Crop Protection & the EU Food System. Where are they going?*, RISE Foundation, available at: https://www.organicseurope.bio/content/uploads/2020/06/RISE_CP_EU_final.pdf?dd.

Plant Protection Product (PPP) residues across Member States to ensure the working of the EU internal single market. It is clear from Article 3.2(d) that this is a public health measure to be achieved through good agricultural practice. The article states that a "'maximum residue level' (MRL) refers to the upper legal level of a concentration for a PPP residue in or on food or feed set in accordance with this Regulation, based on good agricultural practice and the lowest consumer exposure necessary to protect vulnerable consumers". MRL levels are intended to facilitate trade and are not toxicological limits. The Regulation is not primarily intended to protect the environment.

Whether pesticide use can be detected on a crop depends on many factors: the crop, the active substance, how and when it is applied and how it interacts with the crop. Systemic pesticides like neonicotinoids, which may be present in all parts of the crop plant, will generally result in detectable residues in or on the harvested crop. For many fruit and vegetable crops, which receive little processing, residues of the pesticide active substance product may be detectable and it is the responsibility of the food chain actors to ensure that the pesticide is used in such a way that levels detected remain below the MRL set for that product. For crop products subject to processing, this may or may not remove all traces of the pesticide. For example, it is likely that the cold pressing of oilseed rape seeds grown using neonicotinoids could well leave detectable residues of the pesticide. Whereas the heat and chemical treatment involved in crystalising sugar from sugar beet may well remove all trace of neonics used in growing the crop.

An MRL is a quantitative standard for pesticides expressed in residue levels that apply to all products sold in the EU/UK market, whether domestically produced or imported (see Box 6 below). For active substances that are not approved for placing on the EU market, either because they are deemed to have adverse consequences for health or the environment, or because no specific MRL has been set (due e.g. to absence of data (trials) on uses), EU legislation requires that MRLs should be set at a default value at 0.01 mg/kg which is deemed to be the lowest concentration that is detectable in testing. This is also known as limit of quantification (LOQ).[103] However, this does not mean that for the non-approved neonicotinoids, the MRL is automatically set at 0.01 mg/kg. Indeed, trading companies and other parties with a legitimate interest can request for MRLs to be revised, including for substances prohibited in the EU. This is known as an "import tolerance" application.[104] Indeed, the MRL regulation acknowledges that non-EU countries might be applying pesticide residue levels that deviate from the EU's MRLs. As a result, it considers it "appropriate that MRLs are set for imported products that take these uses and the resulting residues into account provided that the safety of the products can be demonstrated using the same criteria as for domestic produce."[105] Specifically, there are two situations in which importers can apply for an "import tolerance": (i) if there is no MRL for the specific pesticide/crop combination in the EU; or (ii) if the existing MRL is lower than that in

[103] Two concepts are defined: the Limit of Determination (LOD) is the lowest analyte concentration that can be distinguished from the assay background, while the Limit of Quantification (LOQ) is the lowest concentration at which the analyte can be quantitated at defined levels for imprecision and accuracy (bias).
[104] Foundation Nicols Hulot, Institut Veblen (2021). Ibid.
[105] Regulation (EU) No 396/2005.

the exporting market, for example, where it is set at the default level. However, for a higher MRL to be granted for imported products, the MRL regulation requires that the MRL was set for reasons other than public health.[106]

Box 6. EU Maximum Residue Levels (the MRL regulation)

In the context of developing core environmental standards, Regulation (EC) No 396/2005, which establishes Maximum Residue Levels (MRLs) ("the MRL regulation") for pesticides that are considered acceptable in agri-food products. Specifically, an MRL is a **quantitative standard** for pesticides expressed in residue levels that apply to all products sold in the EU/UK market, whether domestically produced or imported. MRLs are based on the risks that residues of active substances pose to the consumer and/or animal. About 70% of EU MRLs are established on the basis of Codex Maximum Residue Levels (CXL) set out in the Codex Alimentarius – a set of international reference values for food production established under the joint guidance of the World Health Organization (WHO) and the FAO with a view to facilitating international trade. This is highly encouraged by the WTO's SPS Agreement, which notes that "to harmonize sanitary and phytosanitary measures on as wide a basis as possible, Members shall base their sanitary or phytosanitary measures on international standards, guidelines or recommendations…". The SPS Agreement explicitly lists the Codex Alimentarius. The SPS Agreement also enables WTO Members to introduce SPS measures that result in a higher level of sanitary and phytosanitary protection, provided this is based on a risk assessment. The EU sometimes sets more stringent MRLs following the recommendations of EFSA.

Specifically, import tolerances, when granted, are based on good agricultural practice in the exporting country and require that: (i) the substance is approved in the exporting country; and (ii) they are not set higher than the exporting country's MRL. Data requirements to set import tolerances are the same as in the EU, except that the residue data focus on the jurisdiction applying for the import tolerance.[107]

[106] MRL regulation, Article 3.2(g).

[107] Matthews, A. (2022), "Implications of the European Green Deal for agri-food trade with developing countries", No 321162, 96th Annual Conference, April 4-6, 2022, KU Leuven, Belgium, Agricultural Economics Society - AES, available at: https://econpapers.repec.org/paper/agsaesc22/321162.htm.

MRLs for neonicotinoids in the UK

All active substances currently approved in the EU are approved in the UK until their expiry dates, and all active substances that are not approved in the EU are unavailable in the UK. At the time of writing, this means that UK MRLs are identical to EU MRLs.[108]

Table 3 below sets out the MRLs for the three neonicotinoids that are not approved in the EU and the UK for a select number of products.[109] Because the use of neonicotinoids is not approved in the UK, most of the food products are set at the LOQ level (indicated by an asterisk). Table 3 predominantly lists the exceptions where an MRL has been set at a higher level. For clothianidin and thiamethoxam, these have been based on Codex Maximum Residue Levels (CXL), whereas for imidacloprid several MRLs are based on import tolerances.[110]

Table 3. UK MRLs for three neonicotinoid pesticides[111]

MRL expressed as mg/Kg	Clothianidin	Imidacloprid	Thiamethoxam
Range of MRLs marked * i.e. at the limit of determination	0.01 to 0.05	0.01 to 0.05	0.01 to 0.05
Notable exceptions			
Citrus fruits	0.06	1.00	0.15
Pome fruits	0.40	0.50	0.30
Some stone fruits	0.15	0.50	0.07
Grapes wine and table	0.70	1.00	0.40
Cane fruits and some berries	.01*	5.00	.01*
Avocado	0.03	1.00	0.50
Mango	0.04	0.20	0.20
Carrots	0.06	0.50	0.30
Tomatoes	0.04	0.50	0.20
Aubergines	0.04	0.50	0.20

[108] The operation of the pesticides regulation in the UK is partly under the responsibility of the UK Health and Safety Executive (HSE), which remains the national regulator for the whole of the UK, and partly under Defra. Under the Irish Protocol, EU regulations continue to apply in Northern Ireland. From 1 January 2021, an independent pesticides regulatory regime has been in operation in Great Britain (England, Scotland and Wales). As a result, new decisions taken under the EU regime, including with regards to active substance and MRL decisions, will not apply in the UK.

[109] HSE (n.d.), *GB MRL Register*, available at: https://secure.pesticides.gov.uk/MRLs/search.

[110] Personal communication with the Pesticides unit, DG Santé, 28 February 2022. The reference where this can be followed up is EFSA Journal 2019: 17(1):5570.

[111] HSE (n.d.), *GB MRL Statutory Register*, available at: https://secure.pesticides.gov.uk/MRLs/Main.

MRL expressed as mg/Kg	Clothianidin	Imidacloprid	Thiamethoxam
Peppers	0.04	1.00	0.70
Leafy brassicas	0.30	.3 to .5	.02*
Lettuce	0.10	2.00	5.00
Herbs and edible flowers	1.50	2.00	.02*
Pulses	0.02	2.00	0.04
Legumes	.01* to .2	2 to 5	.02* to .3
Olives for oil	0.09	1.00	0.40
Rapeseed/Canola	.02*	0.10	.02*
Barley	0.04	0.10	0.40
Rice	0.50	1.50	.01*
Hops	0.07	10.00	0.09
Tea	0.70	0.05	20.00
Coffee beans	0.05	1.00	0.20
Sugar beet roots	.02*	0.50	.02*
Sugarcane	0.40	.05*	.01*
Muscle (swine, beef, sheep)	.02*	0.10	0.02
Milk	0.02	0.10	0.05

The fact that there are many MRLs set above the limit of quantification indicates, in some instances, that the domestic ban on neonicotinoids is not always translated into LOQs and, in other instances, that the domestic ban on neonicotinoids is not automatically applied to imported products due to import tolerances. Indeed, some are more than ten times higher than the LOQ (e.g. avocados and peppers) or hundreds of times higher than the LOQ (e.g. lettuce). For two of the sensitive products for the UK, rapeseed and sugar beet, the MRLs for imidacloprid have been set respectively 10x and 25x above the LOQ. In short, regulatory divergence in the case of neonicotinoids is demonstrated by the fact that they are available for use in exporting countries and import tolerances have been set much higher than the LOQ for one of these pesticides.

Sustainable Use of Pesticides Directive (SUD)

Having looked at the regulatory frameworks applicable to banning neonicotinoid use in the UK and EU, this section considers the 2009 Sustainable Use of Pesticides Directive (SUD), which seeks to "achieve a sustainable use of pesticides in the EU by reducing the risks and impacts of pesticide use on human health and the environment and promoting the use of Integrated Pest Management (IPM) and of alternative approaches or techniques, such as non-chemical alternatives to pesticides."

Operationally, the Directive requires Member States to adopt National Action Plans (NAPs) to ensure its objectives are met. The Directive identifies specific measures that Member States are required to include in their plans for implementation. The main actions relate to:

- Integrated Pest Management (IPM)
- Training of users, advisors and distributors
- Inspection of pesticide application equipment
- Prohibition of aerial spraying
- Protection of the aquatic environment and drinking water
- Limitation of pesticide use in sensitive areas (Article 12 lists these)
- Information and awareness raising about pesticide risks
- Systems for gathering information on pesticide acute poisoning incidents, as well as chronic poisoning developments, where available

In 2020, as Brexit approached, the UK's four devolved administrations consulted jointly on a revised NAP for pesticides.[112] The commitment to review the NAP for pesticides was written into the UK's 25-year Environment Plan. One of the stated objectives was to increase the uptake of IPM and sustainable pesticide use. It was also recognised that there was a need to improve metrics on pesticide and IPM use and to review the operation of regulation of bio-pesticides, to encourage greater uptake of these within IPM. The 12-week consultation period concluded in late February 2021. A review of the responses was published in December 2021[113], and a revised NAP is expected to be published in spring 2022 and jointly adopted by the four administrations.

Private voluntary certification

In addition to the various government initiatives, there are also numerous private voluntary certification schemes that work in concert with the regulations in place. Private regulatory initiatives can be flexible and innovative with a more international scope in terms of their coverage and applicability.[114]

From the point of view of farmers, the most practical expression of the implementation of the SUD and the UK's NAP is embraced in the set of standards set out in the UK Red Tractor

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[112] Defra (2020), *Consultation on the 'Revised National Action Plan for the Sustainable Use of Pesticides (Plant Protection Products)'*, available at: https://consult.defra.gov.uk/pesticides-future-strategy/sustainable-use-of-pesticides-national-action-plan/supporting_documents/NAPConsultationDocument.pdf.

[113] Defra (2021), *Sustainable use of pesticides: draft national action plan – Consultation outcome Summary of responses*, available at: https://www.gov.uk/government/consultations/sustainable-use-of-pesticides-draft-national-action-plan/outcome/summary-of-responses.

[114] Federal Ministry for Economic Cooperation and Development (BMZ) (2013), "Recognition of Private Certification Schemes for Public Regulation Lessons Learned from the Renewable Energy Directive" (Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)), available at: http://bioresproject.eu/wp-content/uploads/2015/08/3-Recognition-of-private-certification-schemes-for-public-regulation_R....pdf

certification scheme. Red Tractor, established in 2000, is a not-for-profit company that runs the UK's largest farming and food assurance scheme.[115] Its voluntary membership of almost 50,000 farmers agree to farming standards covering social, health and safety, employment, animal welfare and environmental standards, which form the basis of buying and sourcing for the major UK supermarkets, household brands and restaurant chains. Therefore, despite its voluntary membership, for most UK farmers, these standards are effectively obligatory if they wish to sell their produce through the main supermarkets and food service providers. The scheme logo is used for products where the certified ingredient makes up at least 95% of the finished product, e.g. milk and meat. The logo is well recognised by UK consumers. Red Tractor claims that £14 billion of British food carries the logo.

The standards are set out in the nine product-based documents covering: beef and lamb, dairy, dairy goats, chicken, ducks, turkey, crops and sugar beet, and fresh produce. The standards are listed under twelve headings:

- Risk assessment
- Documents and Procedures
- Personnel
- Traceability and Assurance
- Vermin Control
- Soil Management
- Environmental Protection and Contamination Control
- Environmental Impact/Conservation and Sustainability
- Integrated Pest Management
- Irrigation
- Storage of Combinable Crops
- Own-Transport for Off-Farm Delivery

The standards are based on a mixture of EU/UK legislated regulations plus commercial requirements and agreed industry good practice. To be certified, all the standards must be met, and there is an independent certification and inspection process (paid for by farmers), which is responsible for monitoring adherence to the standards. The standards are constantly reviewed and, when necessary, revised through a complex consultative process across the whole food chain involving food processors, retailers and consumers. If farmers are found to be in non-conformance with a standard, they have 28 days to provide evidence that steps have been taken to rectify this. If this is not achieved, membership and certification may be suspended. If a farmer's Red Tractor certification is suspended or withdrawn, they may have difficulty in selling their produce.

[115] Red Tractor (n.d.), *About Red Tractor*, available at: https://redtractor.org.uk/about-red-tractor/.

Standards relevant to this neonicotinoid case study can be found in the Red Tractor combinable[116] crops and sugar beet standards document.[117] The intention in drafting these standards is to communicate in plain language that farm operators can understand. The document for each category summarises the standard and its aim. It explains how the performance will be measured, and what records must be kept.

Table 4 lists the 17 aims of the standards under the section on Environmental Protection and Contamination Control (coded EC) relating to Plant Protection Products (pesticides). It indicates that there are in total 66 requirements that farmers in the UK must follow to retain their certification in the Red Tractor scheme. It should be mentioned that there may be other requirements impacting the use of Plant Protection Products under the other 11 headings in the Red Tractor scheme for these crops.

Table 4. List of aims of the 66 Red Tractor requirements in relation to pesticides for environmental protection and contamination control in combinable crops and sugar beet

Standard Number	Aim of the standard	Number of requirements
EC1 Key	Potential pollutants must be stored in a manner that minimises the risk of contamination and pollution to crops, feedstuffs, animals, soils, groundwater and watercourses	7
EC1.1 Key	The PPP store must be of a suitable design, construction and layout (13)	13
EC1.2	A list of stored PPPs must be available and updated on a regular basis	1
EC2	In the case of packaging breakages PPPs must be transferred to a suitable container (2)	2
EC4 Key	Key: PPPs must be appropriate for their intended use (4)	4
EC4.1	PPPs are mixed/handled in a manner that minimises the risk of contamination and pollution	5
EC5	PPPs must be applied in a manner that minimises the risk of contamination and pollution	5
EC6	PPP application must be undertaken by competent operators	2
EC7	All PPP application equipment must be maintained and tested	3

[116] Combinable crops are those that can be harvested by a combine harvester, chiefly cereals and oilseeds. These are often referred to by the French term, "grandes cultures".
[117] Red Tractor (2021), *Version 5: Combinable Crops & Sugar Beet Standards*, available at: https://assurance.redtractor.org.uk/wp-content/uploads/2022/01/RTStandardsV5_Crops_v2.pdf.

Standard Number	Aim of the standard	Number of requirements
EC7.1	PPPs must be transported in manner that minimises the risk of contamination and pollution	3
EC7.2	Where metaldehyde is used, it must be used in a manner that reduces the risk to water, birds and small mammals	4
EC7.3	Where granular nematicides are used, use must be in accordance with the Nematicide Stewardship Programme (NSP) Best Practice Protocol	6
EC7.4	Advisers making recommendations on PPP use must be on the BASIS Professional Register	1
EC7.5	Surplus spray mix must be dealt with in a manner that minimises the risk of contamination and pollution	2
EC8	Records must be kept of all PPP applications	3
EC8.1	Systems must be in place to ensure statutory harvest intervals for PPPs are complied with	1
EC11	All wastes which cannot be utilised are disposed of in a manner that minimises the risk of contamination and pollution	4
17 standards		66 requirements

This collection of effectively enforced requirements therefore constitutes the management practices aspect of the environmental standards relevant to pesticide use in the UK. It is clear that they deal with a large number of practical details that a farmer must know about, actively manage and be capable of demonstrating compliance with. Many of these aspects demand management and operator time and therefore costs; some require appropriate investment. This collection of standards can be described as the qualitative element of the UK environmental standards for crop production.

However, the standard does not clearly define IPM, nor does it identify priority hazardous pesticides, including neonicotinoids, or require plans on how the use of non-approved pesticides can be phased out.

Two other private certification schemes that do specify restricting the application of neonicotinoids are summarised in Table 5 below.

Table 5. Private voluntary schemes and their criteria on restrictions of neonicotinoids

Standard	Criteria on restriction of neonicotinoids
Bee Better Certified	The Bee Better Certified™ scheme claims to be "the only third-party verified eco-label that certifies pollinator and biodiversity conservation on farms".[118] In its Background to Production Standards document, it outlines the following standards: Standard 2.2d: "The use or application of nitroguanidine neonicotinoids (clothianidin, dinotefuran, imidacloprid, and thiamethoxam), including the use of seeds treated with nitroguanidine neonicotinoids, is prohibited on certified land". Standard 2.4a: "Do not use pesticides other than herbicides in designated permanent pollinator habitat".
Rainforest Alliance	The three neonicotinoids, clothianidin, imidacloprid and thiamethoxam, and phenylpyrazole fipronil have been incorporated in the Rainforest Alliance Prohibited Pesticide List, because they significantly affect bee populations, other pollinators and birds, can persist for years in soils, and can leach into waterways and groundwater where they have depleted insect abundance and diversity. Rainforest Alliance also included the three active ingredients aluminium phosphide, magnesium phosphide and phosphine in its list, as their use as a fumigant to control rodent populations in storage facilities can lead to death by inhalation.[119]

4.1.4 The case for a CES for neonicotinoids applicable to imported agri-food products

As set out in the previous section, while the UK bans the use of three neonicotinoids substances, it does not automatically apply this ban to imported products. Indeed, it allows for the setting of import tolerances in situations where an MRL has been set for purposes other than public health. This section will illustrate the effects of the ban on neonicotinoids on UK production of certain crops and the effect on imported products from countries where neonicotinoids are still available. It shows that for the crop for which neonics were considered by farmers as most important (oilseed rape), yields have declined, and imports have increased since the neonicotinoids ban. It further explains added costs for UK farmers associated with complying with the neonicotinoids ban.

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[118] Bee Better Certified (n.d.), *Bee Better Certified™ – The Food Industry's Only Third-Party Verified Pollinator Conservation Eco-Label*, available at: https://beebettercertified.org/

[119] Rainforest Alliance (2017), List for Pesticide Management, List of Prohibited and Risk Mitigation Use Pesticides, p. 3, available at: https://www.rainforest-alliance.org/wp-content/uploads/2017/11/02_lists-pesticides-management_en.pdf

Before the EU/UK introduced restrictions on the outdoors use of three neonicotinoids (clothianidin, imidacloprid and thiamethoxam) in 2013, these substances were almost exclusively used as seed treatments on cereals, oilseeds and sugar beet to tackle sap-sucking insects, especially various beetles, aphids and weevils. For instance, as set out in Table 6 below, in 2012, all of the neonic use that year was as seed treatments on these crops, with the majority being on wheat and oilseed rape followed by sugar beet and winter barley. Sometimes the neonicotinoids are applied in a mixture with a fungicide. The estimated total tonnage of the products listed applied in the UK in 2012 was 82.7 tonnes – about 43% of the total weight of all seed treatments used in 2012 in the UK (193 tonnes).

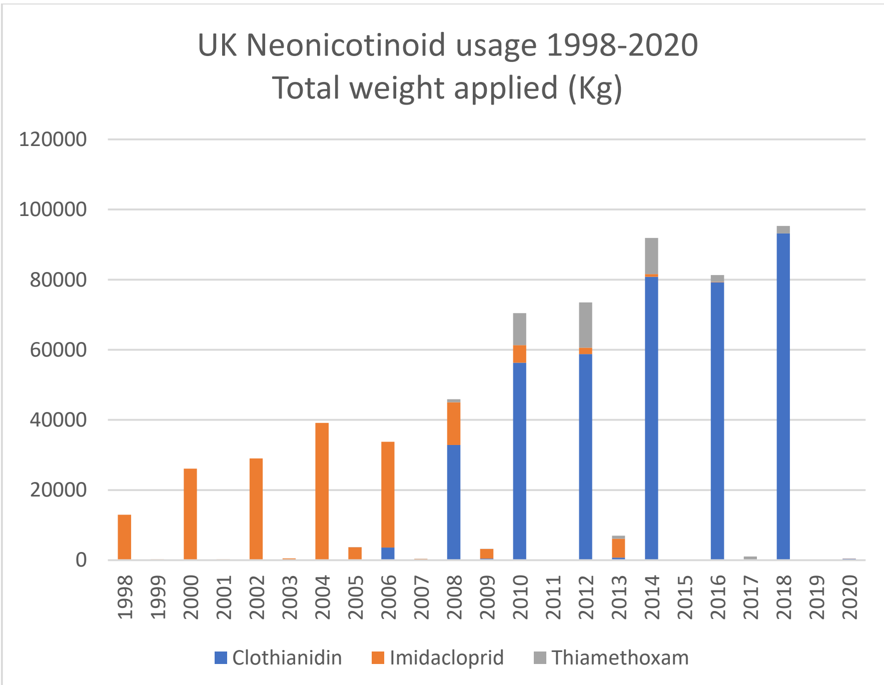
Table 6. Seed treatments on UK arable crops 2012 by weight of active substances

	Seed treatments by weight of active substance applied (kg)							
2012 UK Arable Crop Survey	**Wheat**	**W Barley**	**S Barley**	**Oats**	**OSR**	**Linseed**	**Sugar beet**	**Totals**
Clothianidin/ prothioconazole	48,040	3,140	40	790				52,010
Clothianidin	6,710	1,370		90				8,170
Fludioxonil/metalaxyl-M/thiamethoxam					8,500			8,500
Beta-cyfluthrin/ imidacloprid								-
Beta-cyfluthrin/ clothianidin					6,650		1,920	8,570
Thiamethoxam							5,490	5,490
Totals	54,750	4,510	40	880	15,150	-	7,410	82,740

Figure 5 below shows the total applications of the three neonicotinoids used in the UK for the period 1998-2020 extracted from the Food and Environment Research Agency (FERA) Pesticide

Use Statistics.[120] It shows that early use was dominated by imidacloprid but, when this active substance was withdrawn, it was subsequently displaced by clothianidin after 2006. Thiamethoxam was used in smaller quantities between 2005-2018. The peak of usage was in 2016 and 2018, just before the use of these products was restricted.

Figure 5. UK neonicotinoid usage from 1998-2020 by total weight applied[121]



As illustrated by Figure 5 above, since the non-approval of clothianidin, imidacloprid and thiamethoxam for all outdoor use in 2018, the use of these three substances in the UK has been almost eliminated. However, as discussed earlier in Box 5, emergency authorisations have been granted for sugar beet production, in part because the threat to pollinators could be relatively contained. The crop that generates the most complaints regarding the ban from farmers' organisations is oilseed rape, which is grown across arable areas of the UK and whose brilliant yellow flowering in late April and May attracts many pollinators. Farmers claim that none of the

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[120] Defra (2020), *Consultation on the 'Revised National Action Plan for the Sustainable Use of Pesticides (Plant Protection Products)', December 2020*, available at: https://consult.defra.gov.uk/pesticides-future-strategy/sustainable-use-of-pesticides-national-action-plan/supporting_documents/NAPConsultationDocument.pdf; Defra (2021), *National Action Plan for pesticides, summary of responses to consultation, 15 December 2021*, available at: https://www.gov.uk/government/consultations/sustainable-use-of-pesticides-draft-national-action-plan/outcome/summary-of-responses; and Red Tractor (n.d.), *About Red Tractor*, available at: https://redtractor.org.uk/about-red-tractor/. Combinable crops are those that can be harvested by a combine harvester, chiefly cereals and oilseeds. These are often referred to by the French term, "grandes cultures" (Red Tractor (2021), *Version 5: Combinable Crops & Sugar Beet Standards*, available at: https://assurance.redtractor.org.uk/wp-content/uploads/2022/01/RTStandardsV5_Crops_v2.pdf.)

[121] FERA Science (n.d.), Pesticides usage surveys, available at: https://pusstats.fera.co.uk/home.

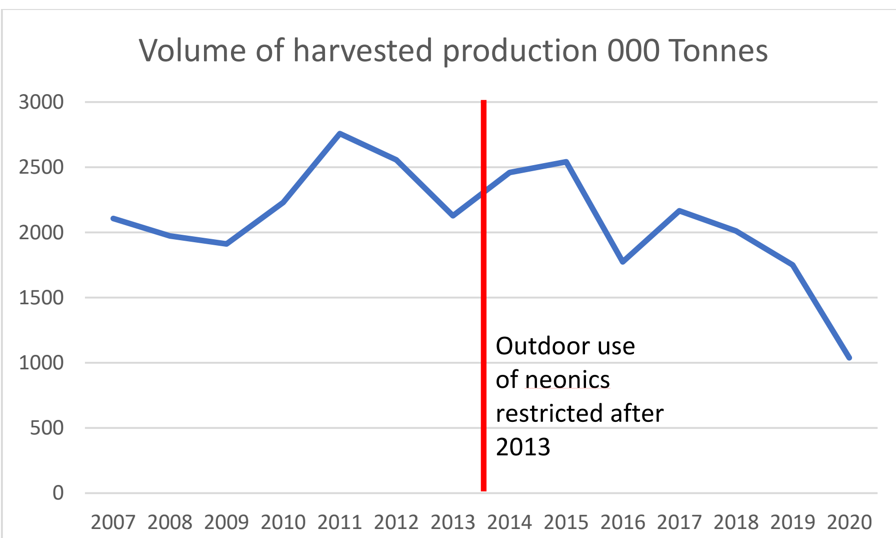
alternative insecticides is as effective as the neonicotinoids and crop losses from flea beetles in particular can be catastrophic.

The UK area of oilseed rape has fallen significantly since its peak in 2012 – a fall of almost 60% from 756 kg/ha to 307 ka/ha in 2021. The 2021 area is the lowest for over 25 years.[122] Yields have always fluctuated, and the result is a downward trend in production since 2011. Figure 6 below shows the volume of UK harvested oilseed rape production and Figure 7 shows the trend in UK exports, imports and net trade from 2007-2020.

Behind the fall in production volume shown in Figure 6, the UK area, yield and production for 2021 was 47%, 93% and 43%, respectively, of the 6-year average 2007-2012 area, yield and production. Likewise, as illustrated in

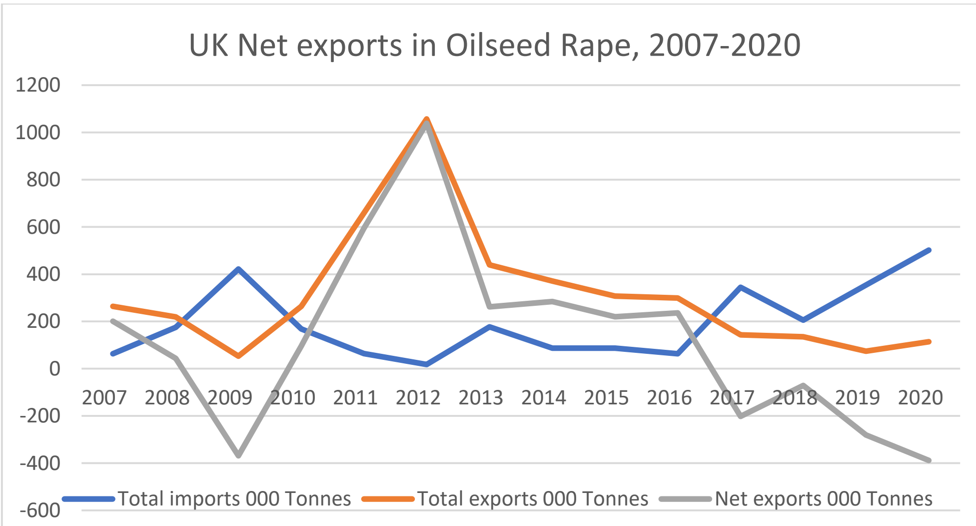
Figure 7 below, exports of oilseed rape declined after 2012, and imports have grown, especially since 2016.

Figure 6. UK oilseed rape production, 2007-2020



[122] Oilseed rape was scarcely grown at scale in the UK until the early 1980s. For a variety of reasons, including the development of varieties which eliminated erucic acid, plus the usefulness of oilseed rape in simplified arable rotations, the area grew steadily to its peak in 2012. The halting and reversal of this trend coincided with the introduction of restrictions in neonicotinoids.

Figure 7. UK oilseed rape exports, imports and net trade, 2007-2020



Farmers' organisations claim that these changes have resulted from the uneven playing field as neonicotinoids are unrestricted in non-European countries resulting in a surge in imports. It is true that in 2017, 2019 and 2020 much of the additional imports came from outside the EU.[123] However, there has also been a 50% rise in imports of oilseed rape from within the EU where neonics are also unavailable.

It is likely that farmers in countries where neonicotinoids are approved may enjoy lower costs and enjoy more consistent, if only marginally higher, yields and therefore a competitive advantage over farmers where the substances are unavailable. Exact figures are difficult to come by. International comparisons of farm management costs of the same product in different circumstances are often complex and not definitive. Apart from differences in weather and soils, there can be profound differences in land and labour costs and farm structures, which determine the comparative advantage of production in one region over another. The question is: to what extent differences in the costs of compliance with regulations impact on competitiveness? Box 7 below provides some insights into compliance costs associated with agricultural regulations in the EU more generally.

[123] Defra, "Agriculture in the UK", 2010, 2014, 2018 and 2021 editions.

In the case of specific pesticides, the farm management economics of a prohibition of use involves the comparative costs of alternative pest management strategies. In the short run, the loss of what was regarded as a highly effective pesticide may be significant yield drop and, thus, output loss. Farmers will seek alternative insecticides and, aside from any difference in the cost of the pesticides themselves, may incur the costs of additional applications of foliar sprays using less effective products. Indeed, this was the experience with sugar beet in 2020, as detailed in Box 5 above.

In the medium and longer term, farmers have to re-learn how to grow their crops without the use of the banned pesticides. This requires full application of the principles of IPM, which starts with longer term rotations seeking to avoid the conditions favouring a large and unmanageable build-up of specific pests and encourages use of the best monitoring and forecasting tools to identify and deal with the early build-up of pests.

Box 7. Overview of costs of compliance with agricultural regulations in the EU

Higher environmental, animal welfare and food safety costs are constantly cited by farmers' organisations in the EU as a justification for border protection and public subsidy. For this reason, the European Commission sought evidence on the matter. The result was a comprehensive 2011 study of costs of compliance of 40 EU regulations and directives impacting agriculture for 12 EU Member States, for 10 agricultural exporting countries, for 8 agricultural sectors. Given the scale of the work required to compile this information, this exercise has not been repeated.

The results, summarised below, showed that typical compliance costs were in the range of 1% to 3% of total production costs. The highest compliance costs were in the pork sector relating to animal welfare. The last column indicates the explanatory factor mentioned in the study conclusions for the country with the highest costs. Environmental standards for nutrients (nitrates directive) and pesticides were mentioned for dairy and for wheat for Denmark.

The overall conclusion of the study was that "care needs to be taken in interpreting these results. A wide range of calculated costs of compliance has been observed. Their impact on competitiveness sector by sector can be very diverse according to the different products and countries". The analysts pointed out that additional costs of compliance were small compared to differences in average production costs observed for the same products between countries. It is well known in farm management data that there are also wide ranges of production costs between farms of the same type within the same country.

Product	Range of average compliance costs	Member State with highest compliance cost	Particular cost mentioned
Cow's milk	0.5 to 1%	Netherlands	Nitrates directive
Beef meat	0.5% to 3%	Italy	Labour and feed costs
Sheep meat	0.5 to 3.5	UK	Feed cost, herd size, productivity
Pork meat	3% to 9%	Germany	Animal welfare
Broiler meat	1.4% to 5.5%	Italy	Capital and non-factor costs
Wheat	2% to 3.4%	Denmark	Nitrates Directive & pesticide tax
Apples	2% to 3%		Labour & machinery costs, compliance costs similar
Wine grapes	0.1% to 4%	Italy	Production system

Source: Menghi et al. (2011), "Assessing farmers' cost of compliance with EU legislation in the fields of environment, animal welfare and food safety", commissioned by the European Commission Directorate-General for Agriculture and Rural Development, AGRI-2011-EVAL-08.

If the economic impact associated with the application of different standards is high enough, it can also have important environmental consequences. For example, as illustrated by the case study on oilseed rape, it can cause changes in domestic resource allocation, which has the effect of reducing domestic production resulting in more imports. Where these imports come from jurisdictions that have not imposed bans on the use of neonicotinoids, then environmental damage is essentially outsourced. This means that, aside from the economic, social and even political costs of this, the lack of CES applied to imported agri-food products would undermine the environmental objective the ban seeks to achieve in the first place.[124]

Moreover, environmental costs may apply even when there is little or no appreciable impact of the high standard on domestic production costs or returns: if exporting countries have a comparative advantage (lower costs, higher productivity) arising from a variety of factors other than the use of a pesticide unavailable in the UK, then they are likely to be exporting to Britain and the EU. Thus, environmental damage to bee populations as a result of neonicotinoid use and to global biodiversity is associated with European imports. In other words, some UK consumption is associated with environmental harm caused by neonicotinoids despite the non-use of these pesticides domestically.

Having made the case for the importance of creating an even playing field for the use of neonicotinoids on agri-imported food products, the next section focuses on relevant considerations in the design of such a measure, with an emphasis on mitigating the risk of exposure to any legal challenges under WTO rules.

4.1.4 Design options for CES for neonicotinoids

On the basis of the observations set out in this section, there is a case to be made for leveling the playing field and ensuring that both imported and domestically produced agri-products are subject to the same regulatory standards, i.e. restrictions on the outdoor use of neonicotinoids. Indeed, the EU has already signalled, in its 2020 Farm to Fork Strategy for EU food and agriculture strategy[125], that it intends to ensure that domestic environmental standards should apply both to home grown and imported food, noting that "[t]he Commission will take into account environmental aspects when assessing requests for import tolerances for pesticide substances no longer approved in the EU while respecting WTO standards and obligations." With respect to MRLs, this sends a clear signal that preparatory work is underway for EU MRLs for all non-approved neonicotinoids to be lowered to the LOQ, justified on the environmental grounds of protecting an issue of global significance – the preservation of honeybees.

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[124] But the environmental costs may apply even when there is little or no appreciable impact of the high standard on domestic production costs or returns. Indeed, if exporting countries have a comparative advantage (lower costs, higher productivity) arising from a variety of factors other than the use of a pesticide unavailable in Europe, then they are likely to be exporting to Europe.

[125] European Commission (EC) (2020), *Farm to Fork Strategy for a fair, health and environmentally friendly food system*, available at: https://ec.europa.eu/food/system/files/2020-05/f2f_action-plan_2020_strategy-info_en.pdf.

When the EU procedures have worked through their regulatory system and resulted in a new table of MRLs for neonicotinoids, it will be for the UK to decide whether to adopt the same MRLs. To this point, the MRL system could be seen as a partial solution to setting a CES in respect of neonicotinoids. Specifically, there are a number of different ways to design CES for neonicotinoids appliable to imported agri-food products. Step 1 concerns ensuring the consistent implementation of UK MRL regulation; whereas Step 2 sets out different ways in which the CES for neonicotinoids applicable to agri-imported food products could be designed, reflecting different levels of trade-restrictiveness and different levels of ambition.

Step 1: Lower all MRLs for clothianidin, imidacloprid and thiamethoxam to the LOQ for all products. It was shown above that, even for non-approved neonicotinoids, the MRL is not instantly changed to the LOQ. To ensure that the non-approval of neonicotinoids is upheld both domestically and with respect to imported products, it is important to ensure that the unavailable substances are reflected in LOQ MRLs across the board.

Step 2: Create an equal playing field on neonicotinoids vis-à-vis imported products. Three ways of doing this are explored:[126]

Option A: Stringent quantitative approach: The more stringent option requires that imported products meet the exact same requirements as UK producers and, therefore, neonicotinoids should not have been used in their cultivation. Specifically, this would mean that producers would not be able to apply for import tolerances with respect to non-approved substances, including neonicotinoids. In other words, producers in non-UK countries must ensure that they do not use neonicotinoids in the production process, and that they meet the new MRLs. This measure is justified by the objective to level the playing field and fairness, i.e., if a particular substance is unavailable for UK producers, it should also be rendered unavailable for producers in third countries exporting to the UK. By removing the double standards that are being applied to imported products compared to UK producers, it might also reduce the pressure on UK farmers to seek softening of the pesticide approval process[127] or to apply for derogations for emergency use.

Option B: Flexible quantitative approach: The more flexible approach would be to require that environmental considerations are incorporated when evaluating requests for import tolerances from trading partners. Due to climate and production differences in different countries, environmental assessments with respect to the implications of neonicotinoids on bees, and the environment more generally, could be different compared to the EFSA findings for European conditions underpinning the restrictions on neonicotinoids. This appears to be the approach that will be adopted by the EU, which notes in its Farm to Fork strategy that "the Commission will take into account environmental aspects when assessing requests for import tolerances for

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[126] Matthews (2022). Ibid.

[127] This is not just a theoretical possibility. The NFU of England and Wales is suggesting, *inter alia*, that the UK should move its pesticide approval process back to a risk-based (i.e. US) approach, rather than the EU's more precautionary hazard-based approach. (See NFU (2018). Ibid.)

pesticide substances no longer approved in the EU while respecting WTO standards and obligations."[128]

Option C: Qualitative approach: This would be the least ambitious approach and would require that all food products placed on the market in the UK originate from farms that demonstrate compliance with sustainable pesticide use and pesticide management principles and practices. Compliance could be assessed based on: (i) the applicable regulatory framework at farm level; or (ii) certification with a credible third party-verified environmental assurance scheme. A key challenge in implementing this scheme would be how to establish equivalence between the pesticide-related requirements in the SUD or updated UK pesticides directive with any regulatory requirements that imported products have complied with.

For establishing equivalence between the pesticide-related requirements in the SUD or updated UK pesticides directive and the third-party standard or environmental assurance scheme, a transparent science-based benchmarking system should be undertaken. Products certified according to a standard that prohibits the use of neonicotinoids, such as organic certification standards or the Rainforest Alliance standard, could benefit from automatic recognition of equivalence. For certification or SUD standards that do not prohibit the use of neonics, this would not result in establishing an equal playing field with respect to the use of neonicotinoid substances between UK and imported producers *per se* but would ensure that imported products are subject to broader sustainable pesticides use and management principles.

4.1.5 Assessing the legal implications of the proposed options

This section explores the potential WTO-related implications of the three options for CES for neonicotinoids as set out above. This analysis is based on the general WTO principles set out in Section 3.1.2 above. Where relevant and appropriate, the legal analysis will refer to additional jurisprudence. At the outset, it must be noted that this section is neither intended to serve as a comprehensive legal analysis nor does it draw conclusions about whether the options proposed are WTO-consistent or not. As neonicotinoid non-approvals have not yet been subject to a WTO dispute, this is mostly a speculative exercise.

Generally speaking, a measure that requires imported products to comply with MRLs for various neonicotinoid substances on the basis of reducing harm to bees could be considered a technical regulation subject to the provisions of the TBT Agreement. In addition, given that the TBT Agreement does not contain the presumption of compliance with the GATT, the measure at issue would also have to comply with the provisions set out in the GATT.

Arguments could be made that applying CES for neonicotinoids could also be an SPS measure, given that it seeks to protect animal or plant life or health. However, the SPS Agreement defines an SPS measure as any measure applied to "protect animal or plant health within the territory of

[128] EC (2020), p. 31. Ibid.

the Member" from risks arising from disease, and from risks arising from additives, contaminants, toxins or disease-causing organisms in foods, beverages or feedstuffs. This means that, to fall within the scope of the SPS Agreement, a country must be able to establish a link between imported agri-food products produced with neonicotinoids and the harm this causes to the bee population in its own territory. Given that the environmental harm associated with neonicotinoids manifests during production and not in the final product, the CES for neonicotinoids will likely fall outside of the scope of the SPS Agreement.

Non-discrimination

For a panel to find that expanding the UK restrictions on neonicotinoid use to imported products is discriminatory, it would need to establish that "likeness" exists between products treated with neonicotinoids and products not treated with neonicotinoids. As noted earlier, four factors are usually considered to determine "likeness": tariff classification, physical qualities, end uses, and consumer tastes and habits.[129] The presence of neonicotinoids residue in the treated products compared to no levels of neonicotinoids in the untreated products might point to different physical qualities. For example, in *EC – Asbestos*, the Appellate Body considered the carcinogenicity or toxicity of chrysotile asbestos fibres – in contrast to Polyvinyl Alcohol (PVA), cellulose and glass fibres – to be a "highly significant physical difference ... in examining the physical properties of a product as part of a determination of 'likeness'".[130]

A peculiar feature that may need to be addressed in the present case is that a product containing neonicotinoids residue is not in and of itself hazardous; rather, it points to the use of neonicotinoids, which has toxic effects on bee populations. Furthermore, if studies can demonstrate different consumer preferences for products treated with neonicotinoids and those that are not, and low degrees of substitutability between the two, these could be further factors to establish the non-"likeness" of the products at issue. If it can be established that products treated with neonicotinoids and those without it are not "like", no discrimination will be found.

If, however, the products were seen as being "like", an analysis of the WTO-inconsistency of the measure would need to focus on the discrimination and/or less favourable treatment that results from the measure. If the UK were to apply Option A and adopt identical requirements for UK-produced and imported agri-products (e.g. MRL of 0.01 mg/kg) or Option B requiring that import tolerance requests would have to be backed up by an environmental risk assessment, there should not be any *de jure* discrimination, as these criteria would, at least *prima facie,* be origin-neutral. To this end, it is important that the measures apply with respect to the same products and that, in situations where MRLs are not set at LOQ, this is the case both for the imported and domestically produced product. Moreover, any derogations and exceptions must not discriminate between imported and domestically produced products and must ultimately be justified in light of the objective of the measure.

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[129] See e.g. Appellate Body Report, *Japan – Alcoholic Beverages II*. See also Panel Report, *US – Gasoline*, para. 6.8.
[130] Appellate Body Report, *EC – Asbestos*, para. 114.

As to *de facto* discrimination, the Appellate Body explained in *EC – Seal Products* that there will be a finding of less favourable treatment "where a measure modifies the conditions of competition between like imported products to the detriment of the third-country imported products at issue."[131] Changes in conditions of competition would exist, for example, if one country was less dependent on neonics use and therefore would have an easier time to comply with the neonics ban compared to another country that is heavily dependent on neonics, thus creating a competitive disadvantage. *De facto* discrimination could further be present if, for example, in the context of Option B, the UK chose to be more lenient to accept a demonstration of low risk to bees from country A compared to country B, or with respect to Option C, would be more lenient in accepting compliance with sustainable pesticide management principles from one country compared to another. In addition, if the UK were to be lenient in enforcing MRLs for unapproved neonicotinoids in the domestic market, but stricter in applying these requirements to imported products, this could likewise give rise to a situation of less favourable treatment. With respect to Options B and C, discrimination could exist if, in analysing the appropriateness of integrated pesticide management systems, the UK was seen to be applying different standards to different countries.

Even when discrimination exists, the question as to whether such a distinction is justified would be considered under GATT Article XX justifications, or as part of TBT Article 2.1, and is further examined in the sections below that cover legitimate regulatory objective, extraterritoriality, even-handedness and trade-restrictiveness.

Legitimate regulatory objective

A measure that seeks to protect bee populations could have several legitimate regulatory objectives, including the protection of life or health of animals, as well as the environment, and could likely also be found to relate to the conservation of exhaustible resources. Indeed, the Appellate Body has found that, under Article XX (g), the protection of endangered species may fall within the scope of exhaustible resources.[132] A claim that the measure seeks to protect the life or health of animals or the environment would require evidence between the measure and the protection of bee populations, whereas claims related to exhaustible resources would require submitting evidence of either the fact that bees are an exhaustible natural resource, or of the effect of declining bee populations on other exhaustible natural resources, such as forests or various wild plants at risk of extinction due to declining bee populations.

In framing the objective of the regulation, UK regulators must think about the local versus global dimension. Currently, the ban on neonicotinoids is based on two EFSA risk assessments that focus exclusively on the link between neonicotinoid use and bee populations in the EU, including the UK. However, to apply neonicotinoid restrictions to imported products, the objective of the measure must be framed beyond protecting EU bee populations. Here, the UK could consider framing the objective of the measure in the same way that the US framed its

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[131] Appellate Body Report, *EC – Seal Products*, para. xx. (5.90/5.115).
[132] Appellate Body Report, *US – Shrimp*.

dolphin-protection measure in the *US – Tuna II (Mexico)* dispute, which concerned a US import ban on tuna caught by suppliers in countries listed as failing to require the use of dolphin-friendly nets. In that case, the US noted that part of the regulatory objective was to "contribut[e] to the protection of dolphins, by ensuring that the US market is not used to encourage fishing fleets to catch tuna in a manner that adversely affects dolphins, taking account of the risks non-fulfilment would create."[133] Likewise, the objective for the CES for neonicotinoids could be framed as seeking to protect global bee populations, by ensuring that the UK market is not used to encourage agricultural production in a manner that adversely affects bee populations.[134]

The UK could also consider framing the objective of the measure as being to protect public morals, a line of reasoning that was accepted in the *EC – Seal Products* case. In that case, the Appellate Body made reference to seal-hunting activities occurring "within and outside the Community" and seal welfare concerns of "citizens and consumers" in the EU Member States, finding that the measure as a whole made a "material" contribution to the protection of public morals regarding seal welfare.[135] For the case of a ban on neonicotinoids, framing the objective in terms of public morals would entail highlighting not only the environmental objective of the measure but the moral interest, pushed for by UK citizens, to refrain from participating in the endangerment of the environment globally through commercial activity.

Extraterritoriality

To establish a "sufficient nexus" between the measure and the UK, CES for neonics would have to be justified by linking the decline of bees in other countries and the UK. This can be done by focusing on the link between the reduction in bee population in countries outside the UK and global biodiversity loss.

The extraterritorial requirement could also be met by focusing on the "public morals" exception under GATT Article XX. As already highlighted previously, this was the approach adopted in *EC – Seal Products*. This case concerned an EU ban on seals and seal products with certain exemptions that, it was argued, violated the GATT. The US claimed that the violations were justified under GATT Article XX(a) as they were "necessary to protect public morals". The Appellate Body found that the combined factors of seal welfare, concerns of EU citizens and consumers, and the fact that the measures were addressing seal-hunting activities both within and outside the EU, sufficient to establish a sufficient nexus.[136] Thus, this suggests that a measure that regulates activities both inside and outside the UK, combined with bee and biodiversity-

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[133] Appellate Body Report, *US – Tuna II (Mexico).*

[134] See Panel Report, *US – Tuna II (Mexico)*, in which the US framed its legitimate objective as : (i) ensuring that consumers are not misled or deceived about whether tuna products contain tuna that was caught in a manner that adversely affects dolphins; and (ii) contributing to the protection of dolphins, by ensuring that the US market is not used to encourage fishing fleets to catch tuna in a manner that adversely affects dolphins, taking account of the risks non-fulfilment would create.

[135] Appellate Body Report, *EC – Seal Products*, para. 2.90.

[136] Dobson, N.L. (2018), "The EU's conditioning of the 'extraterritorial' carbon footprint: A call for an integrated approach in trade law discourse", *Review of European, Comparative & International Environmental Law,* 27(1), 75-89, available at: https://doi.org/10.1111/reel.12226.

related welfare concerns of UK citizens, could constitute a "sufficient nexus" to support the justifiability of a measure under Article XX(a).[137]

Regardless as to whether the UK adopts Options A, B or C, and similar to considerations about framing the "legitimate regulatory objective", these aspects must be taken into account when designing the measure.

Even-handedness

To recall, one factor to look at when assessing whether the application of a measure constitutes unjustifiable or arbitrary discrimination is to examine whether the measure leaves room to assess conditions in relevant exporting countries. Under Option A, neonicotinoid restrictions based on EU risk assessments would be automatically transposed to imported products. This does not enable examining the conditions and circumstances in these countries. For instance, depending on climate and soil characteristics, farming systems and the geography of ecosystems, the link between neonicotinoid usage and bee population decline is weaker in these countries compared to the EU. The measure, however, would not allow for the "inquiry into the appropriateness" of the regulatory programme with respect to conditions prevailing in these countries. Thus, it would likely be difficult to claim that the measure had been applied in an even-handed way.

Option B, by contrast, would incorporate in its design an examination of the situation in the exporting programme, as it would also allow for the request of import tolerances, in part on the basis of environmental risk of neonicotinoids to bees. Therefore, it would minimise the risk of the measure being found not to have been applied in an even-handed way. Option C, as long as it allows for pesticide management schemes with equivalent levels of protection to Red Tractor and SUD to be considered, would also militate in favour of a finding of even-handedness.

It is further important to note that the pursuit of a legitimate objective implies a certain level of consistency in application, such that it does not undermine the measure's full achievement, for example, through the granting of exceptions. In the case of CES for neonicotinoids, if MRLs at LOQ are applied only with respect to some products but not others, or if emergency authorisations for the application of neonicotinoids are repeatedly granted over many years in the UK, this could undermine arguments that seek to justify discriminatory treatment under the chapeau of GATT Article XX. Moreover, evidence that, despite imposing restrictions on neonicotinoid use on domestic and imported products, the UK continues to export neonicotinoids to other countries could be damaging to a claim that the measures are necessary to protect animal health, public morals, or to conserve exhaustible natural resources.[138] In sum, the granting of any exceptions must be tightly circumscribed and regulated to ensure that it does not detract from the overall objective of the measure.

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[137] Ibid.

[138] Dowler, C. (2021), *Revealed: Europe and the UK's vast shipments of banned, bee-killing 'Neonicotinoids'* [online], available at: https://unearthed.greenpeace.org/2021/11/18/revealed-europe-and-the-uks-vast-shipments-of-banned-bee-killing-Neonicotinoids/.

Trade-restrictiveness of the measure

One of the elements panels look at – both under GATT Article XX and the relevant TBT articles – concerns whether the measure is not more trade-restrictive than necessary to achieve a legitimate regulatory objective. This analysis entails understanding the degree of contribution the measure makes to its objective. In this analysis, panels may look at risk assessments and other types of technical and scientific evidence underlying the measure.

Here, there are two risk assessments underlying the adoption of restrictions on neonicotinoid use, focused on the link between neonicotinoids and bee populations in the EU. If the objective of the measure is framed as protecting bee populations globally, this may not suffice in linking restrictions on neonicotinoid use on imported products to bee preservation. Additional evidence of the link between neonicotinoid use and bees in other jurisdictions might also have to be demonstrated. If the objective is framed as preserving public morals that seek to prevent the UK from contributing to environmental decline globally through trade, then evidence would likely have to be introduced that reflected the existence of this public moral sentiment.

With regards to the availability of a least trade-restrictive alternative, between the options set out here for a CES for neonicotinoids, Option B, which allows importers to request import tolerances on the basis of carrying out a risk assessment of the link between neonicotinoid use and bee populations, will be less trade-restrictive than Option A, which would not allow for import tolerances to be granted on the basis of risk. Option C, which would require compliance with general pesticide management practices, would be even less trade-restrictive but it is perhaps likely to make a lower – perhaps significantly lower – contribution to the objective of protection of bee populations, as it is less stringent.

Implications of the legal analysis for CES for neonicotinoids

As demonstrated throughout the analysis, and as summarised in Table 7 below, the relevant legal provisions have different implications with respect to the three proposed options for CES for neonicotinoids. Option B would be preferred, as it reflects WTO principles most closely while, at the same time, it is sufficiently stringent to enable the UK to adopt the environmental policy it considers appropriate. More generally, a key takeaway of the legal analysis concerns linking the CES for neonicotinoids to UK consumer tastes and preferences. This could contribute to making a case that products that contain neonicotinoid residues and products that do not contain neonicotinoid residues are not "like", and therefore that the measure is not discriminatory. At the same time, this evidence could be used to advance the narrative that the neonicotinoid ban has been adopted on the basis of public morals. Some caution must be adopted for Option A, given the inflexibility in design of the measure and the inability to take into account the relevant circumstances in importing countries. Moreover, when making justification arguments focused on the necessity of the measure on the basis of the environmental objective it seeks to accomplish, it would be important to ensure a sufficient nexus between the UK and the environment. This could be done by focusing on the global commons of protecting biodiversity. Justification arguments could also be made on the basis of public morals, which would emphasise the link between citizens and consumers and bee population welfare.

Table 7. Overview of implications of WTO rules for CES for neonicotinoids

	Option A	Option B	Option C
Discrimination	While arguments could be made that products treated with neonicotinoids and those not treated with neonicotinoids are not "like" based on different physical characteristics (neonicotinoids residue) and consumer preferences, these arguments might not be sufficient, and a panel could still consider the two products to be "like". If products were found to be "like", there could be findings of *de facto* discrimination depending on whether the measure modified conditions of competition and depending on application and implementation of the measure. This discrimination can be justified, provided it meets the conditions set out in Article XX of the GATT, or, if analysed under the TBT Agreement, if it is the result of a legitimate regulatory distinction and meets various other conditions. This leads us to explore the measure's legitimate regulatory objective, even-handedness and trade-restrictiveness, as set out below.		
Legitimate regulatory objective	Important to consider how to frame objective of the measure. Possible framing could include seeking to protect global bee populations, by ensuring that the UK market is not used to encourage agricultural production in a manner that adversely affects bee populations.		
Extraterritoriality concerns	Need to establish "sufficient nexus" between the measure's objective and UK territory. This can be done either through public moral arguments or global environmental harm routes (i.e., establishing that harm to bee populations outside the UK harms biodiversity globally, which impacts the UK).		
Even-handedness	The measure does not allow examination into whether it is appropriate to importing countries, thus, likely not even handed.	The measure would enable taking into account importing countries' conditions, thus, being even-handed.	The measure would enable taking into account importing countries' conditions, thus, being even-handed.
Trade-restrictiveness of the measure	Because it requires MRLs at LOQ without allowing for import tolerances, this would be the most trade-restrictive measure. A panel could find measure	This option is less trade-restrictive than Option A, as it allows for an examination of the conditions in the exporting country.	This option is less trade-restrictive than A and B, as it does not impose restrictions on products on which neonicotinoids have been used. However,

	Option A	Option B	Option C
	not necessary to achieve legitimate regulatory objective.		it may not be stringent enough to meet the UK's appropriate level of protection.

4.2 Case study 2: the case for CES for nitrogen application levels

4.2.1 Introduction

This case study considers developing CES for a particular aspect of crop nutrition. It has been chosen to demonstrate the importance of moving towards CES on issues of environmental concern where the UK's regulatory regime is thought to be more stringent compared to key importing countries. Specifically, the sections below will focus on the environmental concern raised by the application of one specific macro-nutrient: nitrogen, and the relevant regulatory frameworks for nitrogen use in the UK. The focus on nitrogen is because this is the most heavily applied nutrient in agriculture and there are specific regulations for its use, yet these regulations are not currently extended to imported agri-food products. The ideas and conclusions on nitrogen may also have applicability for the other environmentally troublesome nutrient phosphorus. After making the case for the importance of developing CES for nitrogen and reviewing the regulations and policies in place to control its use in the UK, this case study provides options to develop CES for nitrogen, followed by a legal analysis that highlights how to incorporate key WTO principles in the design of the measure.

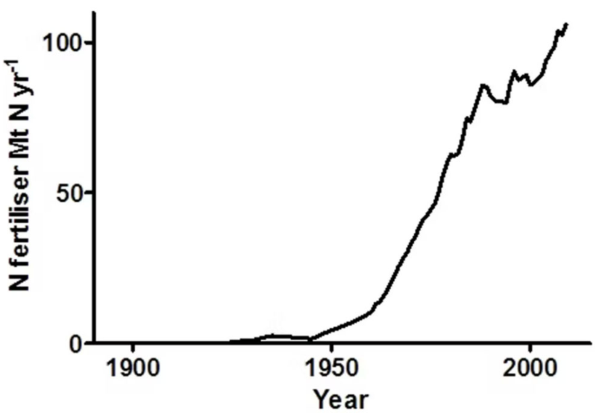
Note that this case study is concerned with the environmental impacts of the excessive use of nitrogen in agriculture. This essential nutrient is applied to land both as manufactured, mineral fertiliser and as manures, composts and green crops. The principal regulatory instrument in Europe is called the Nitrates Directive, although this directive is used to control all chemical forms of nitrogen, so the terminology unavoidably slips between nitrogen and nitrates.

4.2.2 The environmental issue of concern

Fertilisers are an essential input to provide nutrients to plants and increase crop yield. The three main macronutrients nitrogen (N), potassium (K) and phosphorus (P)[139] are required by every crop, every year though not necessarily by external application. All living organisms require the right quantity of nutrients at the right time. However, problems arise with agriculturally applied nutrients because they tend to be overused.[140] Each year, globally, about 100 megatonnes (Mt) of nitrogen fertiliser are applied to various crops.[141] As illustrated by

Figure 8 below, the global use of nitrogen in fertiliser has significantly increased over the last 50 years, reflecting demographic changes as the world population has trebled from 2.5 billion to 7.7 billion, and the accompanying green revolution in agriculture.[142]

Figure 8. Overview of the *increase of global nitrogen fertiliser use*[143]



It is in society's interests that fertile agricultural land is used to the maximum sustainable extent to produce food crops, and higher yields require higher nutrient inputs.[144] However, the processes involved in the mobilisation of the nutrients in the soil into the plant involves highly

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[139] Healthy crop growth and, thus, healthy food and healthy animals and humans also require many essential micronutrients and trace elements. In addition, soil acidity sometimes has to be corrected by additions of lime.

[140] Wertz, J. (2020), *Farming's growing problem*, available at: https://publicintegrity.org/environment/unintended-consequences-farming-fertilizer-climate-health-water-nitrogen/.

[141] Cross, A. and Garnett, T. (2012), *Agriculture's hunger for nitrogen oversteps planetary boundaries*, available at: http://theconversation.com/agricultures-hunger-for-nitrogen-oversteps-planetary-boundaries-10182.

[142] Haddad, M. (2020). "Infographic: How the world's population tripled in 70 years", Al Jazeera, 11 July 2020, available at: https://www.aljazeera.com/news/2020/7/11/infographic-how-the-worlds-population-tripled-in-70-years.

[143] Cross and Garnett (2012). Ibid.

[144] Fixen, P. Bruulsema, T., Garcia, F. and Brentup, F. (2015), "Nutrient/fertilizer use efficiency: measurement, current situation and trends", in Drechsel et al. (eds.), *Managing water and fertilizer for sustainable agricultural intensification*, pp. 8-38, available at: https://www.fertilizer.org/images/Library_Downloads/2014_fue_chapter_1.pdf.

complex interactions of fungi, mycorrhiza, bacteria and other organisms with crop roots.[145] The result is that, in common practice, more nutrients are applied to agricultural land than are taken up by crops, and the fate of the surplus is often damaging to the environment.[146] The extent of the imbalance between nutrient inputs into the agricultural system and the offtake in crops and eventually in human nutrition has now been measured for nitrogen and phosphorus as documented in the following sections. It is partly an unavoidable consequence of the inherent inefficiency of nutrient inputs and leakiness of the biological systems to additions of nutrients above natural levels.[147] Whether the imbalance could be eliminated, and even by how much it can be reduced, is a matter of scientific inquiry. Meanwhile, there is the more pragmatic task of seeking to minimise the extent of surplus nutrients being applied to agricultural land.

At a global level, and as illustrated in

Figure 9 below, nitrogen and phosphorus surplus in the environment is already exceeding what have been suggested are the safe planetary boundaries, that is, the safe operating space for humanity based on the intrinsic biophysical processes that regulate the stability of the planet.[148]

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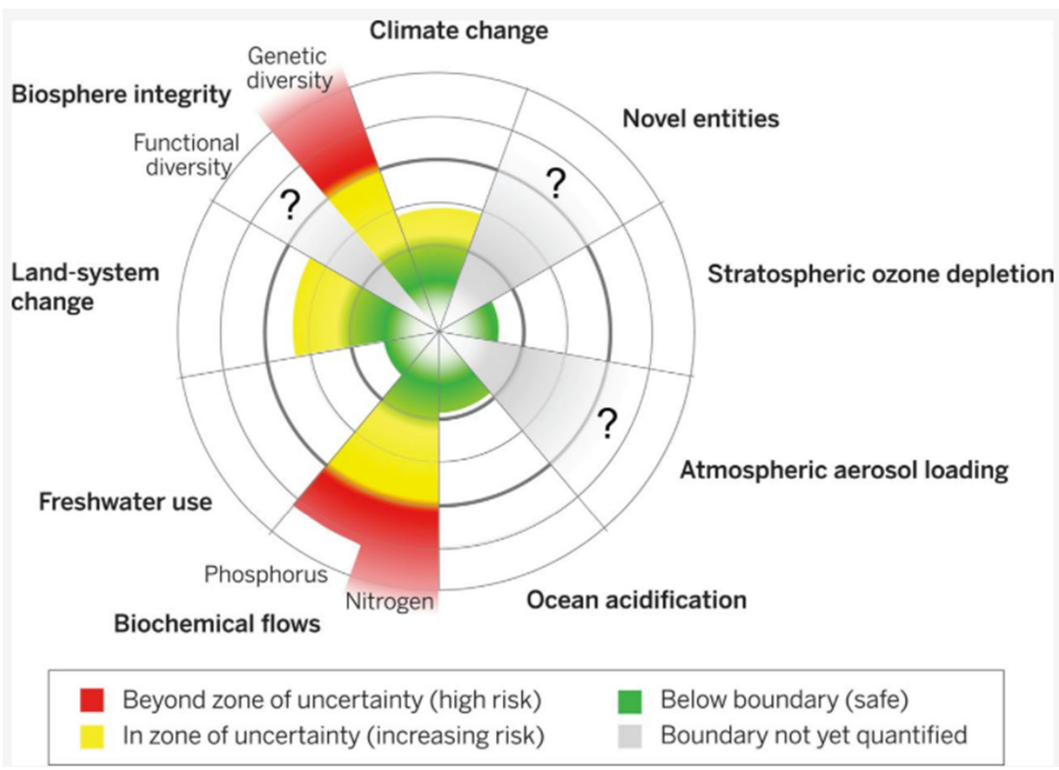
[145] https://www.agronomy.k-state.edu/documents/nutrient-management/nmrg-soil-nutrients,-sources-and-uptake.pdf.

[146] Klages et al. (2020), "Nitrogen Surplus – A Unified Indicator for Water Pollution in Europe?", *Water,* 12(4), pp. 1197, available at: http://dx.doi.org/10.3390/w12041197.

[147] Snyder, C. (2012), "Nitrogen Loss Pathways – Which is Yours", *Plant Nutrition Today*, Spring 2012, No. 6, available at: https://nutrientstewardship.org/implementation/nitrogen-loss-pathways-which-is-yours/.

[148] Steffen, W., Richardson, K., Rockstrom, J., Cornell, S.E., Fetzer, I. and Bennett, E.M. (2015), "Planetary boundaries: Guiding human development on a changing planet", *Science*, 347(6223), available at: https://doi.org/10.1126/science.1259855.

Figure 9. Overview of the nine planetary boundaries and their risk of being exceeded[149]

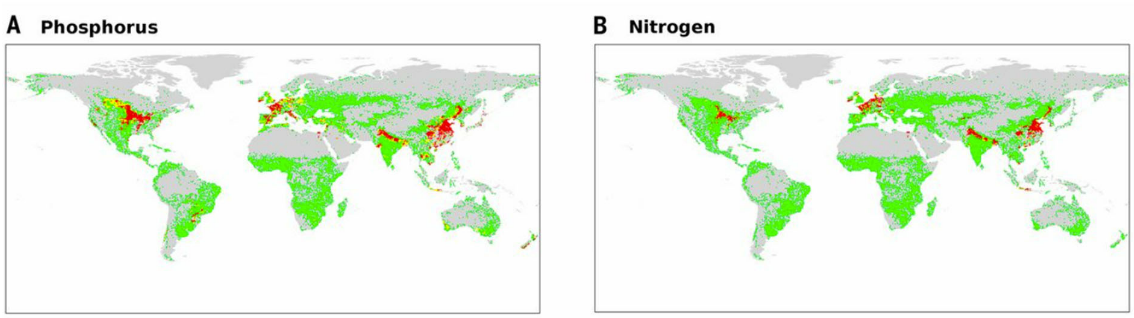


[149] Ibid.

The main contribution to the anthropogenic perturbation of both the nitrogen and phosphorus cycles is linked to the application of fertilisers – both manufactured mineral fertilisers and manures applied to crops and grassland.[150] The extent of fertiliser use is uneven, and naturally concentrated in zones of intense agricultural production. This is illustrated in

Figure 10 below, which shows that a relatively small number of agricultural regions of very high phosphorus and nitrogen application rates are the main contributors to the intense use of fertilisers.[151]

Figure 10. Sub-global distributions of phosphorus and nitrogen[152]



[150] Steffen et al. (2015), p. 44. Ibid. It must be noted that manure is also a main contribution to excessive nitrogen levels.
[151] Ibid.
[152] Ibid.

Beyond zone of uncertainty (high risk) | In zone of uncertainty (increasing risk) | Below boundary (safe)

Narrowing down from global considerations to Europe and the UK, detailed assessments of nutrient flows for nitrogen and phosphorus for the EU for the period 2000-2004 were analysed by Leip et al. (2014)[153], Sutton et al. (2011)[154] and van Dijk et al. (2016).[155] These studies and the environmental impacts of the flows are discussed in a report by the Rural Investment Support for Europe (RISE) Foundation (2016).[156] The following data is cited from this report.

Table 8 below summarises the nitrogen flows for nitrogen for 2000 and 2004 for the EU. It can be seen that the average annual total input of nitrogen across the EU for that period was estimated in the order of 16.7 million tonnes – 65% of this came from mineral fertiliser, 18% from imported feeds and 17% from the combined effects of nitrogen fixation, atmospheric deposition (in part relating to multiple sources of nitrogen pollution) and soil processes. Note that, in such calculations, the nitrogen entering the system from animal manure (both from grazing animals and housed animals) is a recirculation flux from the crops to the animal feed and back to the soil (for reference, the amount is about 7.2 Mt). The fact that the uptake of nutrients is a rather inefficient and leaky process is shown by the fact that, of the added 16.7 Mt, only 2-3 Mt are estimated to be taken up and used through human food consumption for their energy and body tissues. Approximately 1-2 Mt finds other uses, 2-5 Mt is solid waste and sewage, and 11-12 Mt leak into water, the atmosphere and soils. Of these leaked amounts, the nitrogen assessment estimates about 6.5 Mt is to the atmosphere (3.5 as N_2, 2.6 and NH_3, the rest as N_2O and NO_x), and about 7 Mt to ground and surface waters.[157]

Table 8. Nitrogen fluxes in the EU agricultural system, 2000 and 2004[158]

Nitrogen fluxes in the EU agricultural system, 2000 and 2004	Mt/year	%
Nutrient inputs		
Mineral fertiliser	10.9	65

[153] Leip, A., Weiss, F., Lesschen, J.P. and Westhoek, H. (2014), "The nitrogen footprint of food products in the European Union", *The Journal of Agricultural Science*, 152(S1), pp. 20-33, available at: https://www.cambridge.org/core/journals/journal-of-agricultural-science/article/abs/nitrogen-footprint-of-food-products-in-the-european-union/A3F5203509819DB98E5D951B8331BAA1.

[154] Sutton, M.A., Howard, C.M., Erisman, J.W., Billen, G., Bleeker, A., Grennfelt, P., van Grinsven, H. and Grizzetti, B. (eds.) (2011), "The European Nitrogen Assessment: Sources, Effects and Policy Perspectives" (Cambridge University Press), available at: https://assets.cambridge.org/97811070/06126/frontmatter/9781107006126_frontmatter.pdf.

[155] Van Dijk, K.C., Lesschen, J.P. and Oenema, O. (2016), "Phosphorus flows and balances of the European Union Member States", *The Science of the Total Environment*, 542(Pt B), 1078-1093, available at: https://doi.org/10.1016/j.scitotenv.2015.08.048.

[156] Buckwell, A. and Nadeu, E. (2016), *Nutrient Recovery and Reuse (NRR) in European agriculture. A review of the issues, opportunities, and actions*, RISE Foundation, available at: https://risefoundation.eu/wp-content/uploads/2020/07/2016_RISE_NRR_Full_EN.pdf.

[157] Ibid.

[158] Ibid.

Imported feed	2.7	18
Other sources (N fixation, atmospheric deposition, soil)	3.1	17
Total nitrogen input(a)	16.7	100
Nutrient destinations		
Food consumers	2-3	
Other uses	1-2	
Solid waste and sewage system	2-5	
Leakage to water, air and soil	11-12	
Consumer intake as % of total inputs	20	

Note: Inputs from manure are an internal circulation flux from feed to animals and do not appear separately. For reference, the manure input is estimated at 7.2 Mt.

To give an idea of how fertiliser nutrients are used in Europe, the nine major crops in the EU in 2014-2015 accounted for 9.4 Mt of nitrogen fertiliser use. About 71% of this was for wheat, barley, grain maize, rye, oats, rice and oilseed rape; 21% was used on grassland; and the rest for silage maize, potatoes and sugar beet.[159] These are all traded commodities. Eurostat data for individual Member States on the shares of direct nitrogen inputs into the EU farm system from mineral fertilisers, manures, nitrogen fixation and atmospheric deposition for 2005-2008 show that UK figures are very close to the average of the EU27. These show that about 45% of UK nitrogen is from mineral fertilisers, 40% from manures, and the rest equally from the two other sources (nitrogen fixation and atmospheric deposition).

Nutrient balances are another commonly used concept in Europe and are also the basis for the policy measures used to encourage more efficient nutrient use. Nutrient balance is a geographically referenced calculation of the difference between the inputs of nutrients in the form of fertilisers, manures and other sources for a defined area, compared to the outputs of nutrients in harvested crops, crop residues removed and the grazing fodder removed from that area.[160] Nitrogen balance therefore calculates the nitrogen input in manure and fertiliser, adds estimated nitrogen deposition and fixation (e.g. from leguminous crops) and subtracts the nitrogen calculated in harvested crops and in grazed fodder crops. A positive result indicates a nitrogen surplus, a negative indicates nitrogen deficit.[161] For many years, the EU has overall been

[159] Buckwell and Nadeu (2016), p. 46. Ibid.
[160] OECD (2020), *Sustainable agriculture – Nutrient balance – OECD Data*, available at: http://data.oecd.org/agrland/nutrient-balance.htm.
[161] European Environment Agency (EEA) (2021), *Agriculture: nitrogen balance*, available at: https://www.eea.europa.eu/data-and-maps/indicators/agriculture-nitrogen-balance-1/assessment.

in surplus.[162] This was estimated at around 49-80 kg/ha between 2004-2011.[163] There is wide variation around this average, the Netherlands with the highest surplus and Romania the only area with a deficit. Nitrogen-use efficiency has been increasing and total use has been trending downwards. The surpluses are therefore decreasing, as shown in a chart compiled by the European Environment Agency[164] and reproduced in

Figure 11. The EU28 nitrogen balance comparing the averages of 2000 to 2003 with 2012 to 2015 fell 18% from 62.2 to 51.1 kg/ha. The comparable nitrogen balance for the UK for these two periods fell from 103.5 to 85.8 kg/ha. The most recent UK figures (2017) remain at 86 kg/ha, second only to the Netherlands in Europe.[165] Multiple years are used when quoting these statistics because there is considerable variability from year to year. There is also great variability between regions within countries, and the greatest problem with nitrogen surplus is that the surplus is concentrated in areas of intense cropping or livestock production – it is a highly regionalised problem.

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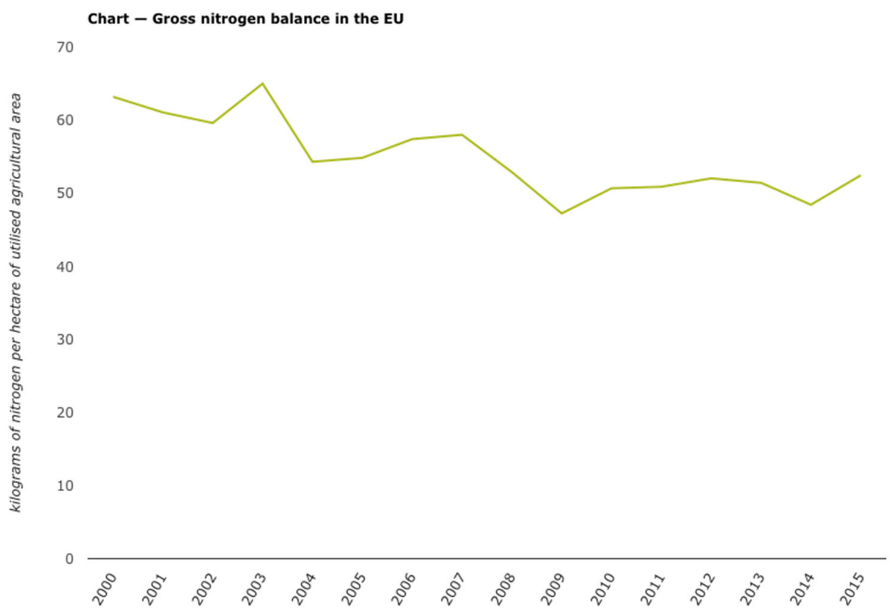
[162] Eurostat (n.d.), *Agri-environmental indicator – gross nitrogen balance*, available at: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Special:Search&search=Agri-environmental+indicator+-+gross+nitrogen+balance (accessed 10 May 2022).

[163] EEA (2021). Ibid.

[164] Ibid.

[165] OECD (2020), *Sustainable agriculture – Nutrient balance – OECD Data*, available at: https://data.oecd.org/agrland/nutrient-balance.htm.

Figure 11. Gross nitrogen balance in the EU, 2000-2015[166]



The fate of the fraction of nutrients not taken up by plants is nearly always environmentally harmful. It appears, sometimes with considerable time lags, as water and air pollution and partly as GHGs – methane (CH_4) and N_2O from inappropriate manure management, and N_2O as an inescapable part of the soil nitrogen cycle – whether the applied nitrogen was mineral fertiliser, manure or ploughed-in crops and their residues.[167] To compound the challenge, not only can use of nitrogenous fertiliser damage the climate, its manufacture is associated with large GHG emissions.[168] Nitrogenous fertiliser is manufactured through the Haber-Bosch process, which combines atmospheric nitrogen and hydrogen usually derived from natural gas under high temperature and pressure. This is therefore a highly energy-intensive activity currently based on fossil fuels.[169]

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[166] EEA (2021). Ibid.

[167] Committee on Climate Change (2018), "The Smart Agriculture Inventory", available at: https://www.theccc.org.uk/wp-content/uploads/2018/08/PR18-Chapter-6-Annex-The-Smart-Agriculture-Inventory.pdf.

[168] Manthiram, K. and Gribkoff, E. (2021), *Fertilizer and Climate Change*, available at: https://climate.mit.edu/explainers/fertilizer-and-climate-change.

[169] Fertilizers Europe (n.d.), *How fertilizers are made*, available at: https://www.fertilizerseurope.com/fertilizers-in-europe/how-fertilizers-are-made/.

After many decades of intensive fertiliser application, the over-enrichment of agricultural soils has profound biodiversity impacts, especially in combination with the other technological developments in plant breeding, crop protection, mechanisation and management of simplified crop systems.[170] High nutrient status encourages plants that best utilise or tolerate such conditions. The result has been the depletion of both soil biodiversity and the biodiversity in, and surrounding, fields. Biodiversity depletion is particularly visible in the disappearance of herb-rich meadows.[171] This has resulted from the nutrient levels, both mineral fertiliser applied and grazing intensity and thus deposited manures, plus the breeding of highly productive and thus competitive forage species. This nitrogen enrichment effect on biodiversity applies more generally across all farmlands and is indicated in the well-documented drop in insect and farmland bird populations.[172] The biodiversity impact does not stop at field level. Excess nutrients are leached into water courses and over time find their way into aquifers.[173]

In addition, applying fertilisers and manures too close to water courses, allowing stored manures and slurry to escape, inappropriate siting and management of livestock units and their wastes and soil erosion by wind and water all provide routes for nutrients to find their way into water. The result, when combined with water treatment outflows (which are currently responsible for significantly less nitrogen pollution but slightly more phosphorous loading than UK agriculture), is nutrient enrichment of water bodies that has damaging impacts on aquatic biodiversity. The most serious effect is eutrophication, which leads to algal blooms, depletion of oxygen in the water and destruction of the aquatic ecosystem in that body of water. These effects are not limited to freshwater, but persist where polluted rivers discharge into marine environments. The result is not just biodiversity loss, but economic losses to wild and commercial fisheries/shellfisheries and reduced concentrations for drinking water treatment.

While some impacts of nitrogen pollution are highly localised, others have a global dimension. For example, the majority of nitrogen released in the UK ends up in the Atlantic or North Sea, and a small percentage reaches neighbouring countries, such as France and Germany. It has been estimated that about 50% of the NH_4-related Particulate Matter in the UK may originate from gases emitted elsewhere in Europe. This is further illustrated in

Table 9 below.

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170 Isbell, F., Reich, P.B., Tilman, D., Hobbie, S.E., Polasky, S. and Binder, S. (2013), "Nutrient enrichment, biodiversity loss, and consequent declines in ecosystem productivity", *Proceedings of the National Academy of Sciences,* 110(29), 11911-11916, available at: https://doi.org/10.1073/pnas.1310880110.

171 Warwickshire County Council (2018), Scientific evidence for habitat creation and restoration, available at: https://api.warwickshire.gov.uk/documents/WCCC-863-794.

172 Benton, T.G., Bryant, D.M., Cole, L. and Crick, H.Q.P. (2002), "Linking Agricultural Practice to Insect and Bird Populations: A Historical Study over Three Decades", *Journal of Applied Ecology,* 39(4), pp. 673-87, available at: http://www.jstor.org/stable/827176 (accessed 7 April 2022).

173 EEA (2020), *Water quality and pollution by nutrients*, available at: https://www.eea.europa.eu/archived/archived-content-water-topic/status-and-monitoring/state-of-groundwater/water-quality-and-pollution-by-nutrients.

Table 9. Fate of oxidised and reduced nitrogen released from the UK for the year 2018, as modelled by the EMEP model (UKCEH)[174]

GB dep on:	Reduced N (kilotonne N yr^{-1})	Rel. share	Oxidised N (kilotonne N yr^{-1})	Rel. share
Great Britain	85.1	37.5%	38.8	16.0%
Atlantic	52.3	23.1%	72.3	29.9%
North Sea	48.9	21.5%	57.9	23.9%
France	5.9	2.6%	9.8	4.1%
Germany	5.5	2.4%	10.3	4.3%
Baltic Sea	3.6	1.6%	6.8	2.8%
Norway	3.2	1.4%	5.4	2.2%
Russia	3.1	1.4%	6.6	2.7%
Sweden	3.1	1.3%	5.4	2.2%
Ireland	2.6	1.2%	2.5	1.0%
Netherlands	2.0	0.9%	2.9	1.2%
Poland	1.5	0.7%	3.7	1.5%
Denmark	1.4	0.6%	2.3	0.9%
Belgium	1.1	0.5%	1.6	0.7%
Mediterranean	1.1	0.5%	2.2	0.9%
Spain	1.0	0.4%	1.6	0.6%
Finland	0.9	0.4%	1.6	0.7%
Ukraine			1.2	0.5%
Belarus			1.0	0.4%

[174] Hicks, W.K., McKendree, J., Sutton, M.A., Cowan, N., German, R., Dore, C., Jones, L., Hawley, J. and Eldridge, H. (2022), "A Comprehensive Approach To Nitrogen In The UK", available at: https://www.wwf.org.uk/sites/default/files/2022-02/WWF_Comprehensive_Approach_to_N_Final.pdf.

In short, the fertiliser aspect of agricultural intensification is an important contributor to terrestrial and aquatic biodiversity depletion and pollution of water and air (especially ammonia from large animal production units and their manure storage), and it is a significant contributor to climate damage through both manufacture of nitrogenous fertiliser and the use of both manures and mineral fertiliser. Biodiversity and climate damage are both global concerns. This therefore qualifies fertiliser use as a candidate for consideration for development of CES to be applied equally to domestic production and imports.

4.2.3 The domestic environmental standards and policy measures in place

To date, nitrogen has received less coordinated international action compared to other air pollutants such as sulphur and carbon.[175] There are international initiatives that seek to prioritise addressing nitrogen. These include the Colombo Declaration, which agreed on a goal of halving nitrogen waste by 2030 through National Nitrogen Action Plans and endorsed the United Nations Environment Programme (UNEP) Road Map for the UNEA-4 Resolution on Sustainable Nitrogen Management.[176] Moreover, a newly established UNEP Nitrogen Working Group is setting up an Inter-Convention Nitrogen Coordination Mechanism (INCOM).[177] As part of the EU European Green Deal, the EU has set the goal of reducing nutrient losses to the environment from fertilisers by at least 50% by 2030 through the development of Integrated Nutrient Management Action Plans (INMAP)[178] "to manage nitrogen and phosphorus better throughout their lifecycle and address nutrient pollution".

UK regulations relevant to fertiliser use are in a state of flux as a result of Brexit. Until they are revised, all of the EU environmental regulations that have been transposed into UK law remain applicable in all parts of the UK. In England, the CAP has been superseded by the Agriculture Act 2020. However, some elements of the CAP remain in force, such as cross-compliance attached to agricultural payments, which will be phased out from 2021-2027, and also rules applying to existing agri-environment schemes that were set up under the EU's Rural

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[175] Chrobak, U. (2021), *The world's forgotten greenhouse gas*, available at: https://www.bbc.com/future/article/20210603-nitrous-oxide-the-worlds-forgotten-greenhouse-gas.

[176] Hicks et al. (2022), *A comprehensive approach to nitrogen in the UK*, available at: http://www.wwf.org.uk/sites/default/files/2022-02/WWF_Comprehensive_Approach_to_N_Final.pdf

[177] UNECE (2020), "UN mobilises action to tackle $200bn per year waste and pollution caused by global nitrogen losses", *UNECE*, 22 December 2020, available at: https://unece.org/circular-economy/press/un-mobilises-action-tackle-200bn-year-waste-and-pollution-caused-global.

[178] EC (n.d.), *Sustainable use of nutrients*, available at: https://ec.europa.eu/info/food-farming-fisheries/sustainability/environmental-sustainability/low-input-farming/nutrients_en.

Development Regulation.[179] Accordingly, this section will focus on key EU regulations relevant to nitrogen and highlight relevant UK schemes, although the most developed of these will relate to England.

There is not a one-to-one correspondence between environmental directives and the intervention measures that have been developed to improve the environmental management of agricultural land. There is not one set of rules each for bird protection, habitat protection, or water protection and so on. Rather, most environmental management schemes are multi-purpose, including those for NVZs, the cross-compliance attached to agricultural payments in the CAP, agri-environment schemes and the new Sustainable Farming Initiative in England. The rules devised under these schemes are in place to achieve the objectives of *all* the relevant environmental directives for birds, habitats, water and nitrates as they apply to agricultural land management. The guidance for NVZs includes aspects that relate to both the Water Framework Directive and the Nitrates Directive. In turn, the practical operation of these rules followed by most farmers on the ground is based on industry-run certification schemes. In Britain, for conventional farmers, this would primarily be the Red Tractor scheme (and adaptations of this by individual food companies); organic farmers would apply the certification schemes run by the Soil Association and Organic Farmers and Growers; and farmers following the principles of Integrated Farm Management would use the LEAF (Linking Environment And Farming) audit scheme. Each such scheme and their requirements on farmers can interact with several environmental concerns. This complicates the issue of defining what is the precise environmental standard for any one environmental concern.

Nitrates Directive

The application of fertilisers in the UK is regulated by the Nitrates Directive (Council Directive 91/676/EEC), which "aims to protect water quality across Europe by preventing nitrates from agricultural sources polluting ground and surface waters and by promoting the use of good farming practices."[180]

The UK implementation of the Nitrates Directive involves several layers of regulations, first the Farming Rules for Water[181], which covers nutrient management on all cultivated land including grassland. It covers applying and storing fertilisers and the management of soil and livestock.

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[179] Rural Payments Agency (2021), *The guide to cross compliance in England 2021*, available at: https://assets.publishing.service.gov.uk/media/5fe09d538fa8f5149718d66e/Guide_to_cross_compliance_2021_v1.0x_acc.pdf.

[180] The current EU rules ascribed in the Nitrates Directive are part of UK statutes via the Nitrates Pollution Prevention Regulations 2015 with corresponding regulations in Wales, Scotland and Northern Ireland. See LexisNexis(2022) for the current status of UK nitrates pollution regulations, https://www.lexisnexis.co.uk/legal/guidance/agricultural-nitrate-pollution-prevention

[181] Defra's Farming Rules for Water for England are explained at: https://www.gov.uk/government/publications/applying-the-farming-rules-for-water/applying-the-farming-rules-for-water

Second are the rules for storing Silage, Slurry and Agricultural Fuel Oil (SSAFO)[182] to reduce risk of spillage and pollution from these materials. Third are the mandatory requirements for NVZs, which are areas designated as being at high risk from agricultural nitrate pollution.[183] In addition, it requires that Member States introduce a Code of Good Agricultural Practice[184], in order to control nitrate loss and protect against nitrate pollution. The current rules on nitrates are set out in UK statutes via the Nitrates Pollution Prevention Regulations 2015 with corresponding regulations in Wales, Scotland and Northern Ireland.[185] The Defra Code of Good Agricultural Practice is for farmers to follow on a voluntary basis, aided by a guidance document.[186] A key farmer-facing booklet explaining the rules is the Nutrient Management Guide (RB209).[187] In all these rules, key principles are that nutrient applications should be explicitly planned and that planning is based on crop needs and soil conditions. The subsequent sections zoom in on the mandatory regulatory requirements that apply in NVZs because these illustrate the more stringent rules for the areas where the problem of nutrient overuse is most critical.

Rules for farmers operating in NVZs

The relevant nitrogen regulations described in this section relate to England, which accounts for just under 80% of nitrogenous fertiliser use in the UK.[188] The requirements that apply to Scotland, Wales and Northern Ireland will almost certainly be identical or very close to those for England.

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[182] Defra's rules for storing silage, slurry and agricultural fuel oil are explained at: https://www.gov.uk/guidance/storing-silage-slurry-and-agricultural-fuel-oil

[183] Defra and Environment Agency (2021), *Nitrate Vulnerable Zones*, available at: https://www.gov.uk/government/collections/nitrate-vulnerable-zones#:~:text=Nitrate%20Vulnerable%20Zones%20(NVZs)%20are,for%20changes%20in%20nitrate%20concentrations.

[184] Defra (2018), *Code of Good Agricultural Practice (COGAP) for Reducing Ammonia Emissions*, available at: https://www.gov.uk/government/publications/code-of-good-agricultural-practice-for-reducing-ammonia-emissions/code-of-good-agricultural-practice-cogap-for-reducing-ammonia-emissions#:~:text=This%20Code%20of%20Good%20Agricultural%20Practice%20for%20reducing%20ammonia%20emissions,organic%20manure%20storage

[185] LexisNexis (2022). Ibid.

[186] Defra (2018), *Protecting our Water, Soil and Air: A Code of Good Agricultural practice for Farmers, growers and land managers*, available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/268691/pb13558-cogap-131223.pdf

[187] Reference Book 209 (RB209) was initially produced by the Ministry of Agriculture in 1973 to guide farmers' use of nutrients. It has been updated frequently since and is now produced by the Agriculture and Horticulture Development Board after extensive consultation with scientists, government and its agencies and industry bodies. (See Agriculture and Horticulture Development Board (AHDB), *Nutrient Management Guide (RB209)*, available at: https://ahdb.org.uk/nutrient-management-guide-rb209)

[188] Defra (2021), *British survey of fertiliser practice 2020*, available at: https://www.gov.uk/government/statistics/british-survey-of-fertiliser-practice-2020

In the UK, agriculture is the dominant source of nitrate in water (about 70% of total inputs), with sewage effluent a secondary contributor (25-30%) nationally.[189] In general, nitrate concentrations are greatest in the drier, arable-dominated southern and eastern areas of England, coinciding with areas most dependent on groundwater for public water supply and base flow to rivers. Action programmes to reduce agricultural nitrate pollution have been in place since the late 1990s, raising awareness in the sector. Along with the 1992 CAP reforms away from production-based payments, these action programmes have contributed to reductions in river nitrate concentrations until more recently, when they have shown increases.[190]

55% of land in England has been designated as a NVZ due primarily to elevated nitrate concentrations in groundwater and rivers, and to a lesser degree because of eutrophication of estuaries and lakes/reservoirs.[191] In 2021, Wales introduced the Water Resources (Control of Agricultural Pollution) (Wales) regulations, subjecting all areas of Wales to the same or similar restrictions to those previously designated as being within a NVZ.[192] Groundwater nitrate concentrations have been broadly stable in many places, except in southern England where they have risen in some areas. This is partly explained by the lag time for the peak agricultural nitrate loadings of the 1980-1990s to percolate through the water table.[193] Changes in farming practice, such as spreading more materials on land, also have the potential to greatly increase nitrate loading locally.[194]

For English farmers in NVZs, the key regulatory document is Defra's *Guidance for Using nitrogen fertilisers in nitrate vulnerable zones* (2018)[195], which is mandatory for farmers and others using manufactured fertiliser, manures or other materials that contain nitrogen on agricultural land in an NVZ.[196] Key aspects of the guidance are the tables of N-max limits, which show the maximum amounts of nitrogen that should be used for specific crops per year measured in kg of nitrogen

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[189] Environment Agency (2021), *Nitrates: challenges for the water environment*, available at: https://www.gov.uk/government/publications/nitrates-challenges-for-the-water-environment.

[190] Environment Agency (2019), *2021 River Basin Management Plan Nitrates*, available at: https://consult.environment-agency.gov.uk/++preview++/environment-and-business/challenges-and-choices/user_uploads/nitrates-pressure-rbmp-2021.pdf.

[191] NVZs are designated when the concentration of nitrate in a given area reaches or surpasses 50 NO_3—mg/L, i.e. having nitrogen concentrations in water exceeding 50 milligrams per litre of water. (UK Parliament (2018), *UK Progress on Reducing Nitrate Pollution – Environmental Audit Committee*, available at: https://publications.parliament.uk/pa/cm201719/cmselect/cmenvaud/656/65607.htm)

[192] CXCS (n.d), *NVZ Regulations*, available at: https://www.cxcs.co.uk/information-on-nvz-regulations/.

[193] Wang, L., Stuart, M.E., Lewis, M.A. and Ward, R.S. (2016), "The changing trend in nitrate concentrations in major aquifers due to historical nitrate loading from agricultural land across England and Wales from 1925 to 2150", *Science of the Total Environment*, pp.694-705, available at: https://www.sciencedirect.com/science/article/pii/S0048969715309438.

[194] Kirchmann, H. and Bergström, L. (2001), "Do organic farming practices reduce leaching?", *Communications in Soil Science and Plant Analysis*, 32:7-8, pp. 997-1028, available at: https://doi.org/10.1081/CSS-100104101

[195] Defra and Environment Agency (2018), *Using nitrogen fertilizers in nitrate vulnerable zones*, available at: https://www.gov.uk/guidance/using-nitrogen-fertilisers-in-nitrate-vulnerable-zones

[196] Ibid.

per hectare. The values range from 120 kg/ha (sugar beet) to 370 kg/ha (for a range of vegetable crops e.g. beetroot and brussels sprouts).

Table 10. Limits on nitrogen that can be applied to crops[197]

Crop	N-max limit (Kg nitrogen per hectare)
Autumn or early winter-sown wheat	220
Spring-down wheat	180
Spring Barely	150
Winter oilseed rape	250
Sugar beet	120
Potatoes	270
Forage maize	150
Field beans	0
Peas	0
Grass	300
Asparagus	180
Celery, courgette, dwarf beans, lettuce, onions, parsnips, runner beans, sweetcorn, turnips	280
Beetroot, Brussels sprouts, cabbage, calabrese, cauliflower, leeks	370

These are intended to ensure that only the amount of nutrient required by the crop is applied. Some crops have specified standard crop yields, which relate to these usage rates, and farmers may use more than these amounts when their expected yield is higher than this standard.

[197] Ibid.

There are also eight other situations specified in the rules which permit higher levels of nitrogen applications.

There are field and farm limits on the application of organic manures. The norm is 170 kg/ha whether spread mechanically or deposited by grazing animals. There is also a specified field limit maximum of 250 kg/ha of total nitrogen from all organic manures spread in any 12 months excluding that deposited by grazing animals. Farmers are expected to use standard table values to estimate the nitrogen content of different types of livestock manure. They are urged to plan their nitrogen use and keep field records. The planning steps for nitrogen for crop production should start with an assessment of the nitrogen already in the soil, which is available for the incoming crop, then the optimal application rate is calculated according to this base amount. The amount to be added by manures or other organic material is calculated next leaving the residual to be applied by mineral fertiliser. A comparable scheme is specified for applying nitrogen to grassland.

The guidelines also cover in some detail the following seven further considerations:

- Assessing the risk of run-off before spreading
- Where you cannot spread manufactured fertilisers or organic manures
- Using manures with high readily available nitrogen
- Working organic manures into the soil after spreading
- When you cannot spread manufactured nitrogen fertilisers (closed periods)
- Exemptions for greenhouses and low-intensity farms
- Keeping records

These guidelines do not explain why each specific requirement is necessary or how it relates to the objective of the Nitrates Directive, although some of the rules make it clear why they are in place, e.g. to prevent pollution of water courses or bore holes. The guidelines state if the requirement is based on a cross-compliance rule, e.g. not spreading organic manure within a 2-metre zone from the centre of an established hedge. Some rules involve adherence to certain actions only within certain dates, while others define closed periods for actions, and still others define the maximum frequency of actions. There are very detailed prescriptions for record-keeping and the mapping required.

In summary, the implementing rules to give effect to the Nitrates Directive are the key instruments defining the environmental standard for nitrogen use in the UK. The key elements of this standard are the designation and publication of NVZs, accompanied by enforced guidelines, which ensure that nitrogen applied to crops within these zones adheres to the principle of application not exceeding crop needs as defined in the guidance manual, and that fertilisers are stored and applied according to the published guidance.

Water Framework Directive (WFD)

In addition to the Nitrates Directive and Defra's guidance for using nitrogenous fertilisers in NVZs, regulations on water quality are also relevant for nitrates. These may also differ between the devolved administrations. For England and Wales, the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (the "Water Framework Directive" or "WFD") apply. These are implemented in river basin districts within England and Wales.[198] In Scotland, the Water Environment (Controlled Activities) Regulations 2011 applies, which controls activities that may affect the water environment.[199] In Northern Ireland, the European Water Framework Directive (2000/60/EC) has been transposed into Northern Ireland regulations through the Water Environment (Water Framework Directive) Regulations (Northern Ireland) 2017.[200]

The WFD encourages the integration of policies for water quality and agriculture by establishing a framework for the protection of "all inland surface water, groundwater, coastal and transitional waters with the aim to enhance the status of aquatic ecosystems, as well as the terrestrial ecosystems and wetlands that are depending on these systems".[201]

It targets surface water pollutants by identifying those that pose the greatest risks (listed in Annex X to the WFD) and requires Member States to identify substances of national or local concern.[202] It also sets out ecological targets for all water bodies aiming to ensure "ongoing substantial investments in water protection measures and water ecology".[203]

Nutrients have proved to be a difficult issue, practically, when it comes to the implementation of the WFD as "the place-based concentration of those sources and differing vulnerability of water ecosystems render uniform policy responses often ineffective."[204] The WFD aims to integrate other key directives linked to water quality such as the Nitrates Directive, however, compliance with the Nitrates Directive (since it focuses on nitrogen) does not address all sources of nutrient pollution in water bodies in order to reach the WFD objective of "good ecological status". Agriculture and rural land management is estimated to be responsible for about 40% of the WFD's "reasons for not achieving good status" failures.[205]

Additionally, the emphasis of the Nitrates Directive is largely on nitrates in groundwater and less on nitrates in surface water. Also, although reducing eutrophication of surface waters is a goal under the Nitrates Directive, its "rough and wide" standards for surface water are not geared to

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[198] Ecolex (n.d), *Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (S.I. 407 of 2017)*, available at: https://www.ecolex.org/fr/details/legislation/water-environment-water-framework-directive-england-and-wales-regulations-2017-si-407-of-2017-lex-faoc164638/

[199] NatureScot (n.d.), *Water Framework Directive*, available at: https://www.nature.scot/professional-advice/protected-areas-and-species/safeguards-beyond-protected-areas/water-framework-directive.

[200] DAERA (2016), *Water Framework Directive*, available at: https://www.daera-ni.gov.uk/articles/water-framework-directive.

[201] Wiering, M., Liefferink, D., Boezeman, D., Kaufmann, M., Crabbé, A. and Kurstjens, N. (2020), "The Wicked Problem the Water Framework Directive Cannot Solve: The Governance Approach in Dealing with Pollution of Nutrients in Surface Water in the Netherlands, Flanders, Lower Saxony, Denmark and Ireland", *Water*, 12(5), p. 1240.

[202] EC (n.d), *Chemicals – Water pollution – Environment – European Commission*, available at: https://ec.europa.eu/environment/water/water-dangersub/index.htm#surface_water_watch_list

[203] Wiering et al. (2020). Ibid.

[204] Ibid.

[205] Environment Agency (2021), *Agriculture and rural land management: challenges for the water environment*, available at: https://www.gov.uk/government/publications/agriculture-and-rural-land-management-challenges-for-the-water-environment

achieving the goals of the WFD.[206] Therefore, Member States may have to take additional measures to improve the status of aquatic ecosystems or to prevent further deterioration (Article 11.3(h) of the WFD states that Member States must take "measures to prevent or control the input of pollutants" from diffuse sources).[207] The provision also regulates those measures and requires that they are periodically reviewed while the WFD itself does not provide instruments to address the agricultural sources of nutrients pollution.

According to the Environment Agency 2020, in England, only 16% of surface water bodies meet the criteria for 'good' or 'high' ecological status, which includes measures of dissolved inorganic nitrogen (mostly nitrate), ammonia and phosphate among others.[208] The situation is better in Scotland where 50% of water bodies achieved 'good' status and 13% achieved 'high' status. In Wales, 40% of water bodies achieved 'good' status.[209]

Policy measures and voluntary certification schemes relevant to nitrogen management on farms

The above sections have outlined the key environmental directives defining the regulatory controls for nitrogen in agriculture. The practical implementation and enforcement of these directives mostly takes place through agricultural policy measures and also through voluntary certification schemes. These are the subject of this next section.

Agricultural policy in the UK in 2022 is *de facto* still mostly operating on the basis of the two-pillar CAP. This is implemented in all the devolved territories with essentially the same set of instruments, but the balance of these instruments and the details of how they apply are adapted to the needs of each territory.[210] The fastest and most far-reaching changes are now underway in England with the adoption of the Agriculture Act 2020, but even here the principal instruments of the CAP – the Pillar 1 direct basic payments and the Pillar 2 agri-environment and climate measures – will only be phased out over a seven-year transition from 2021-2027.[211] The replacement arrangements in Scotland and Wales are still under development and, in the meantime, the CAP-based measures remain in place.

Cross-compliance

The key mechanism, which has been used across the EU, and that still operates in the UK while ex-CAP payments are still in place, is cross-compliance. This means that all claimants for basic

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[206] Wiering et al. (2020). Ibid.

[207] Lexparency (n.d.), *Article 11 Water Framework Directive – Programme of measures*, available at: https://lexparency.org/eu/32000L0060/ART_11/

[208] Environment Agency (2020), data available at: https://environment.data.gov.uk/portalstg/home/item.html?id=bcec2775501841d7a4dacef57e291b61; Hicks et al. (2022).

[209] Joint Nature Conservation Committee (JNCC) (n.d.), *UKBI – B7. Surface water status | JNCC – Adviser to Government on Nature Conservation*, available at: https://jncc.gov.uk/our-work/ukbi-b7-surface-water-status/

[210] Just Rural Transition (2022), *UK Agriculture Policy and Devolution – Just Rural Transition*, available at: https://justruraltransition.org/case-study/uk-agriculture-policy-and-devolution/

[211] Defra (2020), *The Path to Sustainable Farming: An Agricultural Transition Plan 2021 to 2024*, available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/954283/agricultural-transition-plan.pdf. Note this only applies to England.

payments – which is effectively all UK farmers who are managing more than 5 hectares of agricultural land – and all farmers who are in agri-environment schemes must respect a set of cross-compliance rules.[212] These rules require farmers to comply with seven so-called Good Agricultural and Environmental Conditions (GAECs), and 13 Statutory Management Requirements (SMRs). Aspects of GAECs 1 through 6 could in one way or another be impacted by a farmer's management of nutrients and cover a range of actions including rules on groundwater, water abstraction and minimising soil erosion.[213]

The principal relevant SMR is SMR1, which requires respect for the use of nitrogen in NVZs.[214] The rules about cross-compliance are quite explicit and, for nutrient use, there are strict calendar dates or intervals before which certain operations cannot be done, or during which they must be done. To take one such example: from 1 February each year, the cross-compliance rules state: "You can apply organic manure with a high readily available nitrogen content (for example slurry, poultry manures or liquid digested sewage sludge) to grassland and tillage land on all soil types from this date if conditions are suitable and you adhere to the quantity restrictions for application of these manures (SMR1)"; and 28 February each year is the "End of the quantity restrictions for application of organic manures with a high readily available nitrogen content (SMR1)."[215] Cross-compliance enforcement includes onsite inspections for 1% of payment claimants per year conducted by Defra agencies – the Rural Payment Agency and the Animal and Plant Health Agency. If an inspector finds something wrong, they use a set of standards (called "verifiable standards") to assess how serious the non-compliance is. This is based on the extent of the non-compliance and how severe and permanent it is. Penalties for intentional or repeated non-compliance ae generally 20% of payments but these can be reduced to 15% or increased to 100% depending on severity, reoccurrence and permanence.[216] Because these rules all emanate from the CAP, analogous cross-compliance rules will apply in the other UK territories, but will be set out by the respective agriculture department for that territory.

Just as CAP Pillar 1 basic payments endure post-Brexit, at least for a period of time, so too will the Pillar 2 multi-year agri-environment and climate schemes run their course until they are replaced by UK-devised equivalents. Again, the arrangements differ between the territories. The scheme outlined below is the Countryside Stewardship scheme, which applies in England.

Environmental Stewardship and Countryside Stewardship

The Environmental Stewardship and Countryside Stewardship are voluntary agri-environmental schemes operated in England, which pay farmers to engage in practices "to look after and

[212] Defra (2019), *The Guide to cross compliance in England in 2019*, available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/918580/Cross_Compliance_2019_rules__GCCE_v2.0_.pdf . Note that essentially the same rules are still in place in 2022.
[213] CXCS (n.d), *What are Good Agricultural and Environmental Conditions (GAEC)?*, available at: https://www.cxcs.co.uk/good-agricultural-and-environmental-conditions-gaec/
[214] Rural Payments Agency (2022), *The guide to cross compliance in 2022*, available at: https://assets.publishing.service.gov.uk/media/61b21acb8fa8f5038358c1c9/Guide_to_cross_compliance_in_England_2022.pdf.
[215] Defra (2019). Ibid.
[216] Ibid.

improve" the environment. These multi-year schemes involve farmers taking environmental actions intended to go above and beyond the regulatory baselines, which should already be complied with given cross-compliance. The payment principles underlying the Environmental Stewardship schemes are that farmers are paid for direct costs of actions they take under the scheme and for income foregone because they are farming generally in a less intensive and more environmentally benign way. In 2020, in England, there were 36,000 agreements covering 3.64 million hectares being paid £305 million, i.e. about £8,500 per agreement on average.[217]

Countryside Stewardship involves a five-year contract with farmers and the scheme offers a number of options to suit different farming systems and to address various environmental challenges. One of the seven challenges includes "reducing widespread pollution from water".[218] Applicants must provide a well-based, cogent plan for improved environmental management of their farm and can claim payments, including annual per hectare payments, when they engage in specific actions. This includes a number of actions related to better nutrient management, as set out in Table 11 below.

Table 11. Payment rates for improved nutrient management in Countryside Stewardship

Category relevant to nutrient management	**2022 payment rates per hectare**
OR1 to OR6 are payments for organic conversion and management	Payment rates range from OR2 Conversion of unimproved grassland £76, to OR5 Conversion of top fruit £960.
SW11 Riparian management strip	£480
SW13 Very low nitrogen inputs to groundwaters	£251
SW14 Nil fertiliser supplements	£148

The core of the English agricultural transition (specified in the Agriculture Act 2020) involves the progressive reduction of CAP basic payments and the building up of a three-tiered Environmental Land Management Scheme (ELMS) in which the driving principle is that farmers will be paid for the delivery of public environmental goods. Its slogan is "Public money for Public goods". The intention, as with the EU agri-environment schemes, is that these schemes involve

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[217] Defra (2022), *Agriculture in the United Kingdom 2020*, available at: https://www.gov.uk/government/statistics/agriculture-in-the-united-kingdom-2020. The data for the schemes in Scotland, Wales and Northern Ireland are also in this document in tables 10.4-10.6.
[218] Rural Payments Agency (2022), *Countryside Stewardship*, available at: https://www.gov.uk/government/collections/countryside-stewardship

farmers undertaking actions which go above and beyond the base reference level of environment requirements and, naturally, they will therefore be expected already to be respecting those base standards.

Sustainable Farming Incentive (SFI)

The Sustainable Farming Incentive (SFI) is a base tier agri-environment scheme that was launched in 2022 as part of the new Environmental Land Management scheme at the heart of the new English agricultural policy.[219] The other two tiers of ELMS are the Local Nature Recovery Scheme (from 2023) and a Landscape Recovery scheme (with pilots launching in 2022).[220] Together, these will replace Countryside Stewardship, and agreement holders for that scheme will be offered the option of converting to the two new schemes. The aims of the SFI are explained by Defra as follows:[221] "Through this scheme, we will pay farmers to produce public goods such as water quality, biodiversity, animal health and welfare and climate change mitigation, alongside food production. These public goods are essential to meeting our 25 Year Environment Plan, Net Zero and animal health and welfare ambitions, alongside our ambitions for a productive and competitive agriculture sector". The scheme has a similar basis to Countryside Stewardship in the sense that it is offering farmers annual payments, usually scaled per hectare to deliver environmental services which go beyond base required standards. The scheme was launched in January 2022 in a limited way with standards for just three aspects: soil management, moorland and rough grazing management and for an animal health and welfare review. The agreements will last 3 years with some flexibility to adjust every 12 months and, as new standards are made available, the farmer can expand the scope of the agreement. Standards for arable and horticultural soils, grassland, nutrient management and integrated pest management are expected to be added in 2023, and further standards in future years.

To exemplify the way the standards are conceptualised, the soils standard is offered at three levels:[222]

- The Introductory Level at £22/ha for which the farmer must test soil organic matter and undertake a soil assessment and produce a soil management plan and undertake to provide 70% winter cover to protect soil and add organic matter to one-third of the land included in the standard each year.
- The Intermediate Level pays £40/ha. It includes the introductory requirements and adds further specifications of the nature of winter cover and organic matter additions.
- An Advanced Level standard is to be added in future and expected to include the intermediate requirements, plus a no tillage option.

[219] Defra (2021), *Sustainable farming incentive: how the scheme will work in 2022*, available at: https://www.gov.uk/government/publications/sustainable-farming-incentive-how-the-scheme-will-work-in-2022/sustainable-farming-incentive-how-the-scheme-will-work-in-2022

[220] Defra and Rural Payments Agency (2021), Environmental Land Management Schemes: Overview, available at: https://www.gov.uk/government/publications/environmental-land-management-schemes-overview/environmental-land-management-scheme-overview

[221] Defra (2021). Ibid.

[222] Defra and Rural Payments Agency (2021). Ibid.

These are all actions with the capability of helping farmers reduce and better manage nutrients. Again, in common with similar such schemes that have been in operation for many years, the standards are defined as management actions with expected outcomes for several aspects of the environment pollution reduction, biodiversity and climate protection. But there is no attempt to specify these outcomes or even explain the broad objectives of each measure.

Nutrient and soil management plans

Although not yet formally part of the SFI, Defra have signalled in a guidance document that nutrient planning by farmers will become part of the scheme in coming years.[223] Their guidance explains the benefits of creating and using a whole farm nutrient management plan describing the risks of nutrient surpluses accumulating as: "... a greater risk of nutrient losses. This can cause water or air pollution, or greenhouse gas emissions". The nutrient budget is then to be used in conjunction with a crop nutrient management plan to ensure the greatest efficiency of resource use. It is explained that developing and implementing these plans may require analysis and testing of soil, manures and feeds and the expertise of appropriately qualified advisers. Information is given on the sources of the required data. Nutrient planning will require close coordination with soil management planning, which is explained in separate guidance.[224] The nutrient and soil management plans, if adopted and followed on the ground, may be important elements in improving nutrient use in agriculture. They are reasonably discrete and identifiable elements of the environmental standard-setting for nutrient management. They are initially to be established as elements of the base tier of the voluntary environmental land management scheme for which the farmer can claim public payments. Once established, however, they could in time become part of the mandatory domestic standard for nutrient management and then would potentially be a candidate element of a CES for nutrient management to be applied to imports.

In summary, there is a substantial body of agricultural policy measures designed, *inter alia*, to regulate agriculture to ensure it respects environmental standards as expressed in environmental directives, including those on nitrogen. Much of this agricultural policy currently involves substantial payments to farmers. In 2020, total UK government expenditure on this policy was about £3.2 billion, of which £2.8 billion were basic payments and £368 million were agri-environment payments. Of this total, two-thirds was in England.[225] However, this is changing, and the basic payments are set to disappear. The extent to which they will be replaced by increased expenditures under the ELMS and other support schemes is not known. Farmers

[223] Defra (2021). Using a whole farm nutrient budget, available at: https://www.gov.uk/guidance/use-a-whole-farm-nutrient-budget. Closely related is the guidance on soil management plans,
[224] Defra (2021), Soil Management Planning, available at: https://www.gov.uk/guidance/create-and-use-a-soil-management-plan
[225] Defra (2022), tables 10.2-10.3. Ibid.

have thus received large public financial support in the EU and the UK to help them achieve and then exceed basic regulatory standards.[226]

Private voluntary certification

In addition to these policy controls and inducements, for many if not most farmers the practical way in which rules and regulations applying to their day-to-day management comes in the form of private, industry certification schemes to which a high proportion, but not all farmers, belong. These include the Red Tractor Scheme for conventional farmers, the Soil Association[227]and Organic Farmers and Growers[228] certification schemes for organic farmers, and for farmers practicing Integrated Farm Management (IFM), the LEAF scheme.[229] In addition, GlobalG.A.P. also contains a number of requirements relevant to nitrogen management.

Integrated Farm Management is an intermediate form of production between conventional and organic farming and has been adopted by several major food retailers in the UK. LEAF Marque-certified businesses implement an IFM approach, which is a whole-farm and site-specific framework to deliver more sustainable farming. LEAF Marque differentiates products which are produced to higher environmental standards than the regulatory baseline or baseline certification. All these certification schemes are industry-run and reviewed. Each has their own independent inspection arrangements and treatment of non-compliance. Farmers pay annually to join such schemes, generally on an area basis. The Red Tractor scheme, how it operates, the level of detail, volume of rules and how it is enforced were summarised in Case Study 1 for neonicotinoids. An analogous set of such rules and enforcement applies to nutrient use.[230] The standards and requirements for nutrient use on farms for combinable crops and sugar beet are summarised in

Table 12 below, showing 11 standards and 27 requirements. A key requirement is that nutrient use must be calibrated according to crop needs and based on appropriate analysis and testing in

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[226] Marshall, J. and Mills-Sheehy, J. (2021), *Agriculture subsidies after Brexit*, available at: https://www.instituteforgovernment.org.uk/explainers/agriculture-subsidies-after-brexit.

[227] Soil Association (2019), *Standards from Farming and growing*, available at: https://www.soilassociation.org/media/15931/farming-and-growing-standards.pdf.

[228] OF&G Organic (n.d), *Organic Farmers and Growers Standards and Certification manual*, available at: https://ofgorganic.org/useful-info/organic-standards

[229] Linking Environment and Farming (n.d). *LEAF Marque Standard*, available at: https://leaf.eco/farming/leaf-marque/leaf-marque-standard

[230] Farmers Weekly (2021), *Red Tractor plans stricter standards from November 2021*, available at: https://www.fwi.co.uk/news/red-tractor-plans-stricter-standards-from-november-2021

Standard EC.9. Comparable tables could be assembled for other crops and for livestock production, where manure management requirements are spelled out.

Table 12. List of the aims of the 27 Red Tractor requirements relating to nutrients for environmental protection and contamination control for combinable crops and sugar beet

Standard Number	Aim of the standard	Number of requirements
EC.1	Potential pollutants must be stored in a manner that minimises the risk of contamination and pollution to crops, feedstuffs, animals, soils, groundwater and water courses	5
EC.3	Nitrogen based fertilisers must be stored in a way that minimises the risk of theft	5
EC.3.1	A list of stored manufactured fertiliser must be kept and updated regularly	1
EC.3.2 (Rec)	It is recommended that you notify the relevant authorities if you are storing certain amounts and types of fertiliser	2
EC.9 Key	Manufactured fertilisers and organic manures must be applied in a manner that minimises the risk of contamination and pollution	8
EC.9.1	Advisers making recommendations on manufactured fertiliser use must be on the Fertiliser Advisers Certification and Training Scheme (FACTS) Professional Register	1
EC.9.2	Fertiliser rates must be based on calculation of the nutrient requirements of the crop and on regular analysis of nutrient levels in soil, plant or nutrient solution	1
EC.9.4	Documented evidence detailing the chemical content (N, P, K) of all purchased manufactured fertilisers must be kept for twelve months	1
EC.9.5	Documentary evidence must be kept which demonstrates that manufactured fertiliser is responsibly sourced and traceable, e.g. from a Fertiliser Industry Assurance Scheme (FIAS) approved supplier	1
EC.10	All manufactured fertiliser application equipment must be maintained and calibrated at least annually	1

Standard Number	Aim of the standard	Number of requirements
EC.10.1	Records must be kept of all applications of manufactured fertilisers and organic manures	1
11 standards		27 requirements

Red Tractor inspection rates are higher than for government cross-compliance and other schemes. Similarly, Organic and IFM certification manuals, as well as LEAF Marque (further explained in Box 8) and GlobalG.A.P. (set out in Box 9) all pay considerable attention to nutrient management.

Box 8. LEAF Marque criteria for nutrient management

LEAF Marque-certified businesses implement an Integrated Farm Management approach, which is a whole-farm and site-specific framework to deliver more sustainable farming. LEAF Marque differentiates products which are produced to higher environmental standards than the regulatory baseline or baseline certification.

LEAF Marque includes various criteria relevant to nutrient management. These include the requirement that there is an implemented nutrient management plan integrated with a manure management plan. Specifically, it details that the nutrient management plan must include the following:

- Calculations of likely crop requirements and account taken of available nutrients in soil, manures, composts and crop residues
- Nitrogen (N), Phosphorus (P) and Potassium (K) applications as well as other nutrients
- Emphasis on efficiency (e.g. optimal use of inputs)
- Emphasis on reducing use (i.e. inorganic inputs and using other substitutes)
- Plan is reviewed at least annually and, where appropriate, updated
- Implementation of the Plan is reviewed at least annually, recording achievements and progress towards all targets, and used to inform updates to the plan

In addition, LEAF contains a number of criteria to manage the application of chemicals. These are:

- Chemicals: general principles
- Criteria on implementation of an Integrated Pest Management (IPM) system
- Criteria on chemical application records and reduction
- Criteria on chemicals: selective and targeted application
- Criteria on protection of non-target areas from agri-chemical use
- Criteria on regulatory recalibration of agro-chemicals application equipment
- Criteria on the principle to use pesticides as last resort only

Source: Reference document LEAF Marque Standard v15.0, available at:
leafuk.org/farming/leaf-marque/leaf-marque-standard.

Box 9. GlobalG.A.P. criteria for nutrient management

Nutrient management is also looked at in the GlobalG.A.P. certification process. For example, it contains a number of questions that must be answered relevant to nutrient management. These are:

- CB 3.6 (minor) Has the producer taken into account the nutrient contribution of organic fertiliser applications?
- CB 4.4.1 (major) Does the producer prevent the use of human sewage sludge on the farm?
- CB 4.4.2 (minor) Has a risk assessment been carried out for organic fertiliser, which, prior to application, considers its source, characteristics and intended use?
- CB 4.4.3 (minor) Is organic fertiliser stored in an appropriate manner that reduces the risk of contamination of the environment?

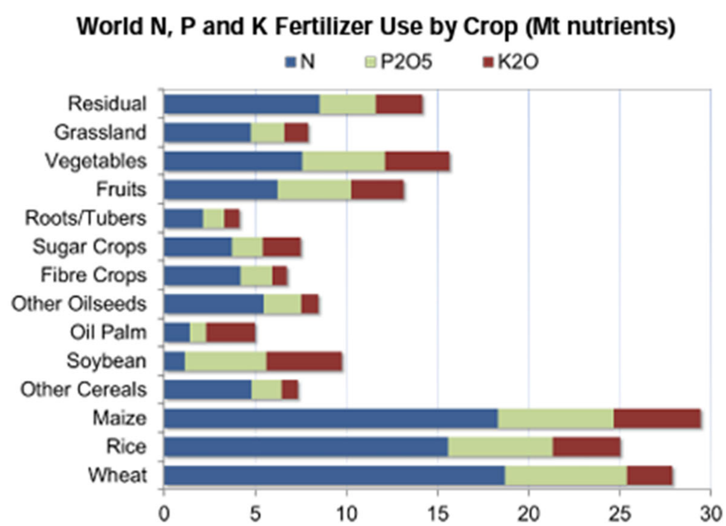
Farmers who opt to convert to organic production undertake not to use mineral fertilisers at all (although they have access to a restricted set of chemical crop protection products). They do, however, use manures and so, in principle, their use of nitrogen could cause any or all of the undesirable environmental spillovers. Manure has a much more variable nitrogen content than manufactured fertiliser. It is generally more dilute and thus bulky and difficult to handle and store without leakage. Without careful measurement and management in how it is produced, stored and spread, it can be responsible for serious pollution. Organic farmers are of course subject to the same rules in NVZs as conventional farmers. For them, the operational rules and certification are overseen by their organic certification body.

It should also be mentioned that individual food companies have their own schemes for encouraging best practice in nutrient management, amongst other considerations. One of many such examples is operated by Arla, a farmer-owned cooperative in five European countries in the milk sector. Arla has contracts with about one-quarter of UK dairy farmers, accounting for about one-third of UK milk output. They encourage their farmers to join their widely defined sustainability strategy, which covers climate, cleaner air and more nature (biodiversity and habitat). Fertiliser use and precision in nutrient management for both animals and crops are key. Their scheme involves detailed record-keeping, with external audit and benchmarking, and adviser follow-up if the results are out of line with expectations.

The case for CES for nitrogen applicable to imported agri-food products

The next step is to translate from the environmental issue of surplus nitrogen to international trade in crops. This is straightforward: all crops require nutrients; but different crops have different requirements. This was illustrated in Table 10 above in the context of the application rates allowable in NVZs. Looking at global use of mineral fertilisers, it can be seen in Figure 12 below that the principal cereals grown in the world – wheat, rice and maize – use the largest shares of nitrogen (N), phosphorus (P) and potassium (K) because they occupy the largest shares of arable agricultural land. The use per hectare of these cereal crops is lower than for many vegetable crops but, since these crops occupy a much larger share of the cultivated land, they account for the most fertiliser use. Fruit, vegetables and oilseeds, especially soyabeans, are the next largest users.[231]

Figure 12. N, P, and K fertiliser use by crop at global levels[232]



The largest agricultural exporting countries will tend to be those with large areas of cropland, which use large shares of that country's total fertilisers.[233] There is a great deal of variation in the intensity of production, including the use of fertilisers, within and between countries and, correspondingly, much variation in crop yields.[234] Some international comparisons are shown in

Table 13 below for yields per hectare for three major traded crops and a range of countries including some of the largest exporters of these crops – plus the UK.[235]

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[231] International Fertilizer Association (2017), *Assessment of Fertilizer Use by Crop at the Global Level*, available at: https://www.fertilizer.org/images/Library_Downloads/2017_IFA_AgCom_17_134%20rev_FUBC%20assessment%202014.pdf
[232] Ibid.
[233] Our World in Data (n.d.), *Excess fertilizer use: Which countries cause environmental damage by overapplying fertilizers?*, available at: https://ourworldindata.org/excess-fertilizer
[234] Ibid.
[235] USDA Foreign Agriculture Service (2022) World Agricultural Production, *Circular Series March 2022*, available at: https://apps.fas.usda.gov/psdonline/circulars/production.pdf.

Table 13. Crop yields for major crops, 2020-2021[236]

tonnes per hectare	2020/21		
	Wheat	Maize	Oilseeds
USA	3.34	10.76	3.21
EU	5.53	7.22	2.26
UK	6.96		2.77
Brazil	2.67	4.37	3.52
Russia	2.98	5.08	1.61
Ukraine	3.71	5.62	2.06
S Africa		5.44	1.97
India	3.44	3.18	0.97
Canada	3.51	9.63	2.49
Australia	2.58		1.95
World	3.51	5.65	2.31

There may be some expected relationship that the higher yields are associated with higher intensity of fertiliser use. For example, the relatively high wheat yields seen in the USA and the UK may indicate higher intensity of nutrient use, as shown in Figure 13. Nitrogen fertiliser use per hectare of cropland, 2002-2017 below.

Figure 13. Nitrogen fertiliser use per hectare of cropland, 2002-2017[237]

[236] Ibid.

[237] Our World in Data (n.d.), *Fertilizers Data Explorer*, available at: https://ourworldindata.org/explorers/fertilizers?tab=chart&facet=none&country=USA~IND~BRA~AUS~CAN~GBR~UKR~Southern+Africa~RUS&Input=Synthetic+fertilizer&Nutrient=Nitrogen&Metric=Applied+%28per+hectare%29&Share+of+world+total=false

It is clear that the UK, along with other EU countries (not shown in Figure 13), is a relatively intense user of nitrogen fertilisers. With regard to trade flows, all trade flows in all agricultural products will implicitly contain the environmental footprint of their nutrient use and management, because all agricultural products will have used nitrogen in their production – whatever the source of that nitrogen.[238] These footprints will vary widely depending on the intensity of nitrogen use and the care and regulation of that use. As maize, wheat and rice are the crops that are the world's largest users of nitrogen[239], the UK's imports of these three crops and the major suppliers of these imports are shown in Table 14, Table 15, and Table 16 below. These figures do not indicate the intensity of fertiliser use, nor the environmental impact of those fertilisers.

Table 14. Principal third country exporters of maize to the UK, 2017-2021[240]

Exporters	Imported value in 2017 (1000 US $)	Imported value in 2018 (1000 US $)	Imported value in 2019 (1000 US $)	Imported value in 2020 (1000 US $)	Imported value in 2021 (1000 US $)
Ukraine	60,319	102,126	204,082	161,158	164,546

[238] Hicks et al. (2022). Ibid.
[239] International Fertilizer Institute and International Plant Nutrition Institute (2017), *Assessment of Fertilizer Use by Crop at the Global Level*, available at: https://www.fertilizer.org/images/Library_Downloads/2017_IFA_AgCom_17_134%20rev_FUBC%20assessment%202014.pdf
[240] ITC calculations based on HM Revenue & Customs (HMRC) statistics since January 2021, available at: https://www.trademap.org/Index.aspx

Canada	29,374	60,041	76,361	31,658	97,140
Argentina	27,842	45,595	48,378	62,028	65,896
Brazil	33,250	37,512	34,426	57,323	17,207
Russian Federation	29,255	519	8,760	9,785	13,050

Table 15. Principal third country exporters of rice to the UK, 2017-2021[241]

Exporters	Imported value in 2017 (1000 US $)	Imported value in 2018 (1000 US $)	Imported value in 2019 (1000 US $)	Imported value in 2020 (1000 US $)	Imported value in 2021 (1000 US $)
India	215,765	79,996	116,531	157,372	166,822
Pakistan	39,440	98,740	95,379	118,278	117,998
Thailand	33,442	45,972	49,019	47,767	31,477
Uruguay	5,882	7,760	6,098	17,743	16,353
United States of America	15,139	12,196	12,103	13,707	13,626

Table 16. Principal third country exporters of wheat and meslin to the UK, 2017-2021[242]

Exporters	Imported value in 2017 (1000 US $)	Imported value in 2018 (1000 US $)	Imported value in 2019 (1000 US $)	Imported value in 2020 (1000 US $)	Imported value in 2021 (1000 US $)
Canada	106,808	115,069	103,470	141,757	199,330
Ukraine	8,134	8,809	15,479	8,460	11,975

[241] ITC calculations based on HMRC statistics since January 2021, available at: https://www.trademap.org/Index.aspx
[242] ITC calculations based on HMRC statistics since January 2021, available at: https://www.trademap.org/Index.aspx

Russian Federation	18,843	15,330	9,547	5,562	7,385
Kazakhstan	4,183	16,757	8,606	0	6,759
Australia	2,063	1,175	3,074	3,745	2,714

Determining the regulatory gap: an illustrative example – Canada

To make the case for developing CES for nitrogen, applicable to imported agri-food products, it would be important to get a sense of the regulatory frameworks for nitrogen applicable in the principle third country exporting countries listed in the tables of commodities that are most heavily impacted by the use of nitrogen. This is a complex task for three reasons.

First, as the previous section has demonstrated, the challenge starts with understanding the regulatory framework that applies in the UK. There are four layers of regulation and policy measures in the EU/UK relevant in addressing excessive use of nitrogen: (i) the nitrates and water framework directives; (ii) the specific designation of NVZs; (iii) a set of policy interventions that encourage and police the compliance of farmers with these rules and attempt to induce even higher standards of environmental performance (these are the Farming Rules for Water, the rules for storing Silage, Slurry and Agricultural Fuel Oil (SSAFO), and the cross-compliance rules and agri-environment schemes); and (iv) the rules and requirements farmers voluntarily sign up to in industry certification schemes (in the UK, the Red Tractor scheme). There are provisions for monitoring and inspections in all these public and private schemes. Ultimately, the standards are expressed in long lists of factors farmers must be seen to be aware of and managing, as exemplified in the above pages.

Second, although at the base of this set of rules is the key principle that fertiliser nitrogen should only be supplied to the needs of the specific crop under cultivation, no single or simple number, or even table of numbers, exists to indicate what that value should be because of the variability in crop needs, soil type and environmental conditions. Rather, the standards for nutrient use are characterised by multiple requirements on farmers to be able to demonstrate they are abiding by the guidance laid down in policy.

Third, the problem of surplus nutrients is highly regional in most countries, therefore, national statistics of intensity of use are not very helpful. Consequently, regulation of nutrient overuse requires some degree of regional differentiation within the country. In the EU/UK, this is managed through the evidence-based definition of NVZs.

These features pose a challenge when making comparisons of the standards between the UK and other countries. To illustrate this difficulty, below is a summary of the arrangements for nutrient management in Canada – one of the principal wheat and maize exporters to the UK. Synthetic nitrogen fertiliser application in Canada has been reported to be eight times the global average per capita and contributes to 3% of global emissions from nitrogen fertilisers.[243] Agricultural fertiliser has also been indicated to have contributed to increased nitrate levels in 10 rivers in Prince Edward Island province according to provincial monitoring of nitrates, which showed the nitrate levels to be over the Canadian Water Quality Guideline for Aquatic Life.[244]Additionally, Canada's Nitrogen Indicator has deteriorated over the past 40 years as fertiliser use has intensified.[245]

In December 2020, the Canadian Government released a climate plan titled "A Healthy Environment and a Healthy Economy", in which it outlined a plan to reduce emissions from fertiliser to 30% below that of 2020 levels.[246] There is a diverse set of regulations in Canada that varies across provinces and the restrictiveness varies as well, e.g. Manitoba and Quebec have the most stringent regulations on land application of manure, where it is totally banned in the winter months, while other Canadian provinces use voluntary manure management systems.[247]

Canada has established nutrient management plans at the farm level in response to the environmental issue of eutrophication and algal blooms.[248] It has introduced two federal programmes – the Environmental Farm Plans and the Environmental Stewardship Incentive, which are intended to be adapted to local, provincial contexts and encourage transfer of knowledge on nutrients.[249] To minimise nitrate pollution, the Canadian Government has also established the Guidelines for Canadian Drinking Water Quality, which sets out basic parameters for water systems to achieve in order to be considered clean and safe. The technical document for these Guidelines assesses all health risks associated with nitrates in drinking water and sets the maximum acceptable concentration at 45 mg/L, which is equivalent to 10 mg/L nitrate-nitrogen.[250] In addition, Canada has several nutrient management regulation plans at provincial level. An overview is provided in Table 17 below.

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[243] Greenpeace Canada (n.d.), *New research exposes climate impact of nitrogen fertilizer worldwide, with Canada one of the worst offenders*, available at: https://www.greenpeace.org/canada/en/press-release/50503/new-research-exposes-climate-impact-of-nitrogen-fertilizer-worldwide-with-canada-one-of-the-worst-offenders/

[244] Yarr, K. (2021), *Nitrate levels climbing in P.E.I. rivers*, available at: https://www.cbc.ca/news/canada/prince-edward-island/pei-nitrates-rivers-fertilizer-1.6174944

[245] Government of Canada (2016), *Environmental Sustainability of Canadian Agriculture: Agri-Environmental Indicator Report Series – Report #4*, available at: https://agriculture.canada.ca/en/agriculture-and-environment/agri-environmental-indicators/environmental-sustainability-canadian-agriculture-agri-environmental-indicator-report-series-report

[246] Fertilizer Canada (n.d.), The Government's New Climate Plan, available at: https://fertilizercanada.ca/wp-content/uploads/2021/05/Emissions-Reduction-Initiative-Impacts-Solutions.pdf

[247] Liu et al. (2018), "A review of regulations and guidelines related to winter manure application", *Ambio*, 47(6), pp. 657-670, available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6131135/

[248] OECD (2017), *Diffuse Pollution, Degraded Waters: Emerging Policy Solutions*, available at: https://www.oecd-ilibrary.org/environment/diffuse-pollution-degraded-waters_9789264269064-en

[249] Ibid.

[250] Health Canada (2020), *Guidelines for Canadian Drinking Water Quality Summary Table*, available at: https://www.canada.ca/en/health-canada/services/environmental-workplace-health/reports-publications/water-quality/guidelines-canadian-drinking-water-quality-summary-table.html#a

Table 17. Nutrient management regulations in Canada[251]

Province	Regulation
Alberta	a) Alberta Operation Practices Act (AOPA, 2002): Through this Act, Alberta regulates its agricultural manure management practices, protection of groundwater and nutrient management. b) Manure Characteristics and Land Base Code (2006): This has land base requirements for different livestock species and sizes of operation.
Saskatchewan	a) The Agricultural Operations Regulations (1996): This controls the management of livestock operations and agricultural waste management.
Manitoba	a) Livestock Manure and Mortalities Management Regulation (2004): This regulation sets out requirements for the use, management and storage of livestock manure. b) Nutrient Management Regulation (2008) This regulates agriculture waste management, water quality protection, and proper nutrient management.
Ontario	a) Nutrient Management Act (2002) This is the main legislation that regulates requirements on producers to meet proper nutrient management.
Quebec	a) Agricultural Operations Regulation (2002): This regulates agricultural practices in Quebec with legislation on nutrient management and agricultural waste control.
Nova Scotia	a) Environmental Regulations Handbook (2004) This regulates farm waste management and water related management practices for the province.

[251] British Columbia Ministry of Agriculture (2017), *Jurisdictional Scan of Nutrient Management Regulations*, available at: https://www2.gov.bc.ca/assets/gov/environment/air-land-water/site-permitting-and-compliance/hullcar/review-docs/631700-3_bc_agri_2017b_jurisdictional_scan_of_nutrient_management_regulations.pdf

To assess the relative stringency of these regulations compared to the UK requires investigating the detailed operational content of these regulations and handbooks to see what facets are covered and how they are covered, and to understand which aspects are advisory and which are mandatory and the respective inspection and enforcement regimes. These tasks will be time-consuming and resource-heavy and, therefore, would be a difficult and perhaps impractical way of establishing a foundation of a CES for nitrogen. Therefore, when analysing nitrogen regulations in other jurisdictions, it would be a starting point to focus on the presence or absence of at least three critical aspects of nutrient regulation:

- The evidence-based definition of nitrate vulnerable zones (or their equivalent).
- The operational requirement on farmers – with back-up recording and inspections – of the principle of nutrient application tuned to crop need.
- The requirement on farmers to have and to follow a whole-farm nutrient plan.

4.2.4 Design options for CES for nitrogen surpluses

This section focuses first on how CES can be designed for the issue of nitrogen surpluses. It then considers how these standards can be presented to have the greatest chance of achieving the objective of ensuring that all UK food consumption has been produced to the same standard whether produced within the UK or imported.

Compared to the case of neonicotinoids, nitrogen surplus is more complex. Whilst excessive nitrogen use causes significant environmental damage to biodiversity and climate, the damage is not uniformly distributed over the land; the pollution tends to be concentrated in areas with large-scale modern farming activity. As detailed in the earlier sections, UK regulations apply to all nitrogen applications over all cultivated land including grassland, however, strongest focus is on the areas of greatest nitrogen surplus. The geographic variation in the scale of the problem is tackled in the UK (and EU) by identifying NVZs. This suggests that the UK's design for a CES that seeks to treat imported agricultural products the same as domestic products should also deploy a zoned approach to address areas that are using, or are at risk of using, excessive nitrogen in farming activities. In this regard, the UK might want to target, through its CES on nitrogen, countries, regions, or farms with high levels of nitrogen use with relatively light regulation on that use and, therefore, at a high risk of causing unsustainable nitrogen use.

There are several options to design such a CES, and the details will necessarily reflect the complexity of existing nitrogen regulation in the UK. Here, we focus on risk-based measures for the CES on nitrogen to be applied to imported agri-products coming from high-risk areas. To determine high-, medium- and low-risk areas, a benchmarking system should be developed.[252] We propose three different design options that can be considered: two options focused on

[252] This would be similar to what the EU has proposed for the regulation on deforestation-free products. See e.g. EC (2021), *Questions and Answers on new rules for deforestation-free products*, available at: https://ec.europa.eu/commission/presscorner/detail/en/qanda_21_5919

country level, and one option focused on farm level. As set out in Box 10 below, these design options reflect the principles of regionalisation and compartmentalisation, which are key SPS concepts used in trade agreements.

- Option A: would require that a country with excessive nitrogen use establishes NVZs comparable or similar to NVZs defined in the UK, in addition to establishing nitrogen management requirements and quantitative limits for nitrogen use per crop similar to the limits applied in the UK.
- Option B: would require that a country with excessive nitrogen use establishes minimum nitrogen management principles. This should include: defining NVZs or equivalent; requiring farmers to use nitrogen application rates based on crop requirements; and requiring farmers to have a farm nutrient plan with appropriate nutrient use recording and inspections to check compliance.
- Option C: In contrast to Options A and B, which focus on nitrogen regulations, Option C would focus on specific farms in high-risk countries. Even if a high-risk country fails to establish minimum nitrogen management principles, Option C would give individual farmers the opportunity to engage in export trade provided that they meet the requisite nitrogen management standard – at the farm level. This reflects the concept of compartmentalisation, which is well established in the context of SPS provisions. One way to administer this would be to consider that have been certified by standard-setting organisations to have nitrogen management plans in place would be considered eligible for export.[253]

4.2.5 Assessing the legal implications of the proposed options

This section explores the potential WTO-related implications associated with adopting the three options of CES for nitrogen as set out above. At the outset, and similar to the neonicotinoids case study, it must be noted that this WTO section is neither intended to serve as a comprehensive legal analysis, nor does it draw conclusions about whether the options proposed are or are not WTO-consistent. Instead, it seeks to highlight the implications of the most relevant WTO rules and jurisprudence for the options proposed.[254]

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[253] Here, SPS provisions could provide some guidance, even though the CES for nitrogen is likely not considered an SPS measure. Under the SPS Agreement, Members must recognise disease-free areas in countries where diseases have broken out, provided a number of regulations are in place. Moreover, the OIE, one of the international standards references in the SPS Agreement, establishes rules for compartmentalisation, i.e. in situations where farms are located in diseased areas, they can still be considered disease-free provided they comply with a number of testing, quarantine, hygiene and other requirements.

[254] As an aside, with the Appellate Body currently not being operational and the risk that a panel decision could be appealed into the void, the risk of being subjected to WTO dispute settlement is arguably lower than it was when the Appellate Body was still operational.

As noted in Section 0, it is an unsettled matter whether PPMs that are not product-related (NPR PPMs) and do not constitute labelling requirements, as is the case for nitrogen CES, are subject to the provisions of the TBT Agreement. Indeed, the question is whether, to constitute a "technical regulation" under the TBT Agreement, the measure must have a physical connection to the product. While the conventional view is that NPR PPMs are not covered by the TBT Agreement, this has not been conclusively settled. As a result, this section will analyse the implications of CES under both the TBT Agreement and the GATT.

CES for nitrogen, while they seek to protect animal and plant life or health, are likely not considered SPS measures as this does not concern a situation where the measure seeks to protect animal or plant life or health in its own territory from an outside pest, disease or contaminant. However, and as set out above, a number of SPS concepts, such as regionalisation and compartmentalisation, are highly relevant when thinking about the design of the CES. These are further explained in Box 10 below.

Box 10. The concepts of regionalisation and compartmentalisation in trade agreements

Both regionalisation and compartmentalisation are concepts that are used in SPS provisions in trade agreements. Regionalisation, which is referenced in the WTO SPS Agreement, requires that measures are adapted to regional conditions – as opposed to the entire country – including in situations concerning disease outbreaks, or low pest or disease prevalence. For example, if a pest breaks out amongst the cattle in country A, country B must not impose an import ban on cattle from the entire country. Rather, the ban must be tailored to cattle imported from the areas designed as diseased. Cattle from the areas designated as disease-free must still be able to be imported. In this way, regionalisation seeks to ensure that the measure is tailored to the risk that is being addressed. Verifications must be able to be carried out and exporting countries must give importing countries reasonable access for inspection, testing and other relevant procedures.

Compartmentalisation, which is not included in the SPS Agreement but referenced in international standards such as the OIE, as well as in some RTAs (e.g. EU-Viet Nam), is also a key concept of risk containment with respect to SPS measures. In essence, the concept of compartmentalisation focuses on whether the farm adopted adequate hygiene and other disease-containment measures such that products and/or life animals originating in the farm are considered to be disease-free and can therefore be cleared for export.

These concepts can be useful when designing CES for nitrogen, given the fact that it should target products that have been cultivated in high-risk areas – and not those areas/countries where excessive nitrogen use is not a problem.

Non-discrimination

For a panel to find that a CES for nitrogen is discriminatory, it would need to establish that "likeness" exists between products that have been treated with excessive levels of nitrogen and products not treated with excessive levels of nitrogen. Applying the customary four likeness factors (tariff classification, physical qualities, end uses, and consumer tastes and habits – explained in the neonics case above) to a CES on nitrogen, it will be difficult to establish that these products are not "like". With respect to tariffs, physical qualities and end-use, the products appear to be "like". Unlike the neonicotinoids case study, there is no physical difference between products cultivated with excessive nitrogen and products cultivated without. Even for organic products, nitrogen is used in their production, albeit in the form of manures, compost, ploughed-in green crops, treated sewage waste and previous crop residues.

Because nutrients are used in all products, it will also be difficult to demonstrate consumer preferences for products that have not been excessively treated with nitrogen compared to those that have. While consumers might have a preference for unpolluted rivers not greened over with algae, it will be a stretch to translate this into a preference, for example, for bread made from flour from wheat that was not treated with excess nitrogen in a region considered nitrate vulnerable. Indeed, it would require having to demonstrate that consumer preferences exist for products that have been produced in ways which avoid excessive levels of nitrates, compared to products whose production is associated with excessive levels of nitrates. In addition, the spatially diffuse environmental problems associated with excessive use of nitrogen have not received as much attention as, for example, climate change or plastic waste pollution. The lack of awareness may make it more difficult to find the existence of consumer preferences for products produced without excessive levels of nitrogen. Therefore, it will most likely be difficult to establish that products treated with excessive nitrogen and products not treated with excessive nitrogen are not "like".

If indeed the products were considered "like", an analysis of the WTO-inconsistency of the measure would need to focus on the discrimination and/or less favourable treatment that results from the measure. To avoid a successful *de jure* discrimination claim, it would be important for the measure to be designed in an origin-neutral way. This would be particularly important for any benchmarking that designates countries as high, medium or low risk, which will be important for options A, B and C as they are all focused on high-risk countries. As set out in Box 11 below, Indonesia has challenged the EU's criteria for determining high-risk Indirect Land Use Change (ILUC) on the basis of which palm oil imports can be banned.

Box 11. EU – Palm Oil (Indonesia) case at the WTO

An ongoing WTO case between Indonesia and the EU might shed further light on how to design PPMs-related requirements to minimise the environmental implications on agri-food products. The dispute concerns a claim brought by Indonesia against an EU regulation that restricts palm oil imports unless they can be certified as low Indirect Land Use Change (ILUC) risk. The claim includes a challenge against the EU's criteria for determining high ILUC risk biofuels. According to the definition applied by the EU, these oils are produced from crops with a significant global expansion into land with high carbon stocks, including forests, wetlands and peatlands. Indonesia alleges that the criteria used to determine high and low ILUC risk are discriminatory. The panel decision in this case will be important to better understand the application of WTO principles with respect to environmental PPMs applied to agri-imports.

Even if only focusing on country-level risk *de facto* discrimination will likely be found, however, because the CES on nitrogen modifies the conditions of competition between "like" imported products to the detriment of a third country exported product. For example, one could imagine a situation where the requirement to have in place adequate nitrogen management regulation would disadvantage certain products in countries that do not have such a regime in place compared to products imported from countries that comply with these requirements.

Moreover, *de facto* discrimination could further be found if the UK would be more lenient to accept a demonstration of regulatory equivalence for country A compared to country B, or if the UK strictly enforces the nitrogen requirements for imported products but is more lenient vis-à-vis UK-produced products. In other words, lack of adequate enforcement of the nitrogen regulatory framework in the UK could be problematic.

Finally, Option C could give rise to discrimination (national treatment) if the requirements to certify with the private voluntary standards to prove that a nitrogen management plan is being adopted would be more stringent compared to the regulatory requirements set out in the UK's NVZs.

In sum, in all likelihood, the CES on nitrogen will be found to be discriminatory as it treats "like" products differently. This means that the emphasis on the CES design would have to be to demonstrate that, based on environmental protection grounds for a global concern such as nitrogen pollution, such discrimination can be justified – either under the exceptions of Article XX or within the embedded justification analysis set out in Article 2.1 of the TBT Agreement. This is addressed in subsequent sections.

Legitimate regulatory objective

There are various ways in which a CES that seeks to reduce excessive nitrogen use in order to stay within a safe operating space can be considered a measure that protects human, animal health or plant life, and/or a measure that protects the environment. As explained in Sections 0 and 4.2.2 above, reducing surplus nitrogen would help protect aquatic life and avoid coastal dead zones. Moreover, decreased nitrogen surplus would help reduce ammonia emissions, and protect terrestrial biodiversity, given the interconnectivity of ecosystems. Reducing excessive nitrogen use would also mean less nitrous oxide as a long-lived GHG, which will benefit the environment. Claims could also be made that the CES on nitrogen seeks to protect exhaustible resources. Indeed, excessive nitrogen use threatens the conservation of aquatic life, including various fish species, which are exhaustible resources.

In order to claim that the measure is necessary, or related to, the regulatory objective, a link must be established between the measure and the regulatory objective it seeks to address. This link would likely be the easiest to establish for the most direct and visible harm associated with excessive nitrogen use: eutrophication, leading to algal blooms, depletion of oxygen in the water and destruction of the aquatic ecosystem in that body of water. This phenomenon has been widely documented and should be possible to establish. In in this regard, and keeping in mind extraterritoriality issues, possible framing of the legitimate regulatory objective could include seeking to prevent eutrophication globally, by ensuring that the UK market is not used to encourage production in a manner that adversely affects aquatic ecosystem.

Extraterritoriality

As noted earlier, a panel will most certainly analyse, in the context of GATT Article XX, whether a "sufficient nexus" exists between the objective of the measure and the country that has adopted the measure when making justification claims under GATT Article XX. One way to do so would be through the global harm route, by highlighting that nutrient loss ends up in the global commons (oceans, atmosphere etc.), and is also considered one of the nine global planetary boundaries not to be surpassed to maintain the earth's environmental stability. An alternative route could be through focusing on public morals, similar to in *EC – Seal Products*.

Even-handedness

For the discrimination set out in the CES on nitrogen to be considered justified, it would be important for the CES to be designed such that it treats countries in which similar conditions prevail in a similar way. For the design of the measure, this would mean adopting the same requirements for countries with high risk of excessive nitrogen use, and the same set of requirements for countries not at risk of excessive nitrogen use. This means that the benchmark on the basis of which "high", "medium" or "low" risk is determined must be firmly grounded in science and applied consistently to all countries. In addition, another factor to look at is even-handedness, that is, whether the measure leaves room to assess conditions in relevant exporting countries.

The even-handedness of the measure will likely be assessed in light of the determination of equivalence of regulatory requirements in NVZs. In other words, emphasis would be placed on whether the determination of equivalence takes into account local conditions in exporting countries, or whether the measure requires that regulatory requirements identical to UK regulatory requirements must be met in NVZs in other countries. Here, Option A, which would require that products coming from NVZs in high-risk countries are produced in accordance with the regulations to which farmers in NVZs in the UK are required to adhere to. These regulations, however, are based on European conditions, and would not allow for the "inquiry into the appropriateness" of the regulatory programme with respect to conditions prevailing in these countries. Thus, it would likely be difficult to claim that the measure has been applied in an even-handed way. By contrast, Option B, which requires that exporting countries at high-risk of excessive nitrogen use have in place the basic principles of a nitrogen management regime, would be more flexible to develop nitrogen management regimes that would allow for variation depending on the specific conditions in the country. Depending on the type of private voluntary standards on which it will be based, Option C would also militate in favour of a finding of even-handedness.

Trade-restrictiveness of the measure

One of the elements panels look at – both under GATT Article XX and the relevant TBT articles – concerns whether the measure is not more trade-restrictive than necessary to achieve a legitimate regulatory objective. This analysis entails understanding the degree of contribution the measure makes to its objective.

To understand the degree of contribution the measure makes to the objective, panels tend to look at risk assessments and other types of technical and scientific evidence underlying the measure. Here, the UK would need to provide scientific studies that link the CES on nitrogen to reducing the harm of excessive nitrogen use, which in turn reduces the harm to aquatic bodies or other environmental systems, depending on how the objective of the measure is framed. To ensure that the measure is necessary to fulfil the objective of reducing excessive nitrogen, it would be important to ensure that the CES is tailored to areas of high risk of excessive nitrogen use.

With regards to the availability of a least trade-restrictive alternative, this would depend on whether the appropriate level of protection (ALOP) set by the UK could be achieved by other measures that are less trade-restrictive. Here, an important consideration is ensuring that the CES focuses not on all trade from all countries but, rather, targets NVZs in high-risk areas. Thus, it would be important for the CES to be designed in a focused manner. Between the proposed measures, Option A is most trade-restrictive, as it prohibits imports if the measure is not based on the UK regulatory regime for nitrates. Option B is more flexible, focusing only on basic nitrogen management principles. The least trade-restrictive approach would be Option C, which enables regions in high-risk countries to still qualify for export if they can demonstrate adequate nitrogen management regimes, even if their country has failed to adopt adequate nitrogen management regimes. However, this might be less effective with respect to the objective of incentivizing farms in high-risk areas to adopt adequate nitrogen management plans.

Implications of legal analysis for CES for nitrogen

While refraining from making conclusions regarding the WTO-consistency of the proposed measure for nitrates, the preceding analysis has sought to highlight a number of relevant WTO principles to take into consideration when designing the CES for nitrogen. Options B and C appear to best reflect these legal principles.

Compared to neonics, it will likely be more difficult to establish that the measure is not discriminatory, in part because whether or not a product has been cultivated with or without excessive levels of nitrogen does not alter the product physically. Moreover, for Options B and C, it is important to ensure that the set of requirements imposed on imported agri-products from high-risk areas are not more restrictive compared to UK regulations. CES that target high-risk nitrogen areas would, however, be *de jure* discriminatory, as they treat different countries differently.

As a result, CES for nitrogen will likely be analysed predominantly under GATT Article XX exceptions or under equivalent provisions in the TBT Agreement that seek to identify whether discrimination can be justified. In this analysis, considerations of even-handedness are critical – that is, whether the measure is necessary to achieve a legitimate regulatory objective, and whether there is a "sufficient nexus" between the objective of the measure and the UK in light of extraterritoriality concerns.

Options B and C would be considered more even-handed as they allow for conditions in the exporting country to be taken into account, whereas Option A does not since it would require adherence to UK nitrogen regulation, which is based on UK characteristics. Similarly, Option A will be most trade-restrictive. Thus, from a legal perspective, it would be advisable to design CES for nitrogen on the basis of Options B and C, or a combination of the two. Table 18 below summarises the key findings in this analysis.

Table 18. Overview of implications of WTO rules on CES for nitrogen

<table>
<tr><th></th><th>Option A</th><th>Option B</th><th>Option C</th></tr>
<tr><td rowspan="2">Discrimination</td><td colspan="3">Given widespread similarities between products that have been cultivated with excessive nitrogen and those that have not, it will be very difficult to establish that these products are non-"like". As a result, CES on nitrogen will likely be found to be discriminatory if it is found to alter conditions of competition. Such discrimination can be justified under GATT Article XX or under the TBT Agreement if it is the result of a legitimate regulatory distinction and meets various conditions. This leads us to explore legitimate regulatory distinction, even-handedness and trade-restrictiveness, as set out below.</td></tr>
<tr><td>Important to design benchmarking of high-, medium- and low-risk countries with respect to excessive nitrogen use according to objective, origin-neutral criteria</td><td colspan="2">Important to ensure that qualitative criteria implemented are not more stringent compared to nitrogen regulation in NVZs in the UK.</td></tr>
<tr><td>Legitimate regulatory objective</td><td colspan="3">Possible framing could include seeking to prevent eutrophication globally, by ensuring that the UK market is not used to encourage production in a manner that adversely affects aquatic ecosystem.</td></tr>
</table>

Extraterritoriality concerns	"Sufficient nexus" could be demonstrated through the global harm route, by highlighting that nutrient loss ends up in the global commons (oceans, atmosphere etc.), and is also considered one of the nine global planetary boundaries not to be surpassed to maintain the earth's environmental stability. An alternative route could be through focusing on public morals, similar to in *EC – Seal Products*.		
Even-handedness	By requiring compliance with UK nitrogen regulations, it does not allow consideration of conditions in the exporting country, thus, likely not even-handed for purposes of GATT Article XX.	Depending on the exact requirements that must be complied with, this measure would be sufficiently flexible to take into account conditions in the exporting country.	Depending on the exact requirements that must be complied with, this measure would be sufficiently flexible to take into account conditions in the exporting country
Trade-restrictiveness of the measure	Important to ensure that measure is designed to target areas of high risk of excessive nitrogen use (NVZs/high risk countries). Option A is the most trade-restrictive of the options analysed.	Important to ensure that measure is designed to target areas of high risk of excessive nitrogen use (NVZs/high risk countries). Option B is less trade-restrictive than Option A.	Important to ensure that measure is designed to target areas of high risk of excessive nitrogen use (NVZs/high risk countries). Option C is less trade-restrictive than Option A.

5. Outlook: promising areas for the development of further case studies and considerations for developing countries

5.1 Some reflections on the neonics and nitrogen case studies

5.1.1 Similarities and differences in the neonics and nitrogen cases

Differences and similarities can be observed in the two case studies featured in this report. A first similarity is that the intensive use of pesticides and fertilisers are complementary characteristics and have been accompanied by structural changes in farming systems characterised as increased scale of operation and simplification while being accompanied by advances in crop breeding, mechanisation and management. In the context of post-World War II Europe, the profound effect of such a system on agricultural productivity, and the economic effect of reducing the real cost of food over a long period were considered key political objectives. However, the same developments have had an equally profound negative impacts on the environment. This has led to the depletion of habitats and biodiversity, polluted water and air, and has contributed to destabilising the climate. The technical developments have been observed in many countries in different climatic and natural zones and with the same deleterious environmental impacts. Each aspect of technical change – pesticide use, application of fertilisers, the use of ever more powerful and sophisticated machinery – has specific effects on environmental resources. However, as all these developments have occurred in tandem, it is hard to precisely separate their individual contribution to environmental damage, both domestically and internationally. This, in turn, has important implications from a policy perspective: a major lesson in addressing the negative impacts observed today is that piecemeal approaches have not been very effective.

Indeed, it has been observed, especially in the nutrients case study, that policy instruments to raise environmental performance are often of a broad-spectrum and cross-cutting nature. Each instrument may contribute to several environmental issues – water and air pollution, biodiversity loss and climate protection. Yet, because of the international trade implications, the CES also have to be considered on a case-by-case basis and in the context of how they relate to specific products.

Conversely, the two case studies differ in important ways: pesticides and fertilisers are both deployed to increase yields, but they do so quite differently. There are just short of 500 pesticide active substances available in the EU and the UK: each is generally specific with respect to the crop and the challenge organisms (weed, fungus, insect or other pest) and, generally, each is applied only when the challenge to the crop is present or an (immediate) threat. In contrast, there are just three macro crop nutrients, nitrogen (N), potassium (K) and phosphorus (P).[255] Each nutrient is required by every crop, every year, though not necessarily by external application. All pesticides are manufactured products and applied in very small doses – generally in the form of seed coatings or foliar sprays on the growing crop. Fertilisers are considerably bulkier, with much higher application rates, measured in tens of kg per hectare. Some are manufactured products, while others are "natural" products, including animal manures, other organic materials such as composts, incorporated crops and treated sewage waste. The manufactured mineral fertilisers are sold as separate nutrients or more usually as compound fertilisers with the appropriate mix of the three macro nutrients N-P-K.

The environmental damage caused by pesticides mostly relates to biodiversity loss and degradation. The environmental damage caused by fertiliser nutrients is of a different kind, the tendency to overuse shows sometimes with considerable time lags, in water and air pollution and partly in the form of GHG. Also, the manufacture of nitrogenous fertilisers especially is extremely energy- and GHG-intensive. It is due to their damaging impacts on biodiversity and climate that both issues explored in the two case studies are rated as global environmental concerns, thus qualifying them for consideration for the development of CES.

5.1.2 Enforcement of environmental regulation: a domestic and international challenge

Another similarity between the use of pesticides and nutrients in agriculture is that they have both proved resistant to efforts to restrain their use. The private economic benefits of both of these input types are still perceived to be strong. The conventional farm management analysis focusing solely on the private short-run economic costs and benefits of their use is persuasive for most farmers. The very explicit encouragement of farmers in both the educational system (farm colleges and universities) and in policy to learn and utilise standard business concepts of marginal cost and benefits bolstered this approach. The business case to using these inputs in a manner to increase technical efficiency and net returns and controlling production risks was a strong one. Growing evidence on undesirable environmental consequences arising from this approach were initially, and for a long time, denied and resisted. Each individual farmer's activity only contributes to a marginal increment in damage, and that damage is initially scarcely perceptible, as it is spread over the whole farmed territory. However, it is the steady cumulative impact as these activities are repeated yearly over decades that has finally provided the overwhelming need for change. Although the evidence, particularly as regards biodiversity loss and climate damage, is now acknowledged by all farming organisations and agricultural supply industries, even now, the pace at which stronger more effective environmental protection measures are being put in place is slow.

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[255] Healthy crop growth and, thus, healthy food and healthy animals and humans also require many essential micro-nutrients and trace elements. In addition, soil acidity sometimes has to be corrected by additions of lime.

This general environment of encouraging farmers to consider themselves as business operators combined with the apparent rewarding benefit/cost ratio of use of nutrients and pesticides is, arguably, a major factor in explaining why enforcement of higher standards – which requires reduction in use of these inputs – has proved difficult. In addition, input suppliers have consolidated globally and acquired considerable market and political power. As a result, the tightening of regulation has been slow to operate and enforcement has been difficult. Control of diffuse pollution over the whole agricultural territory coupled with the long time lags before the damage is perceived, e.g. in coastal waters, is not a simple task. The EU Nitrates Directive has been in force for three decades and, although nitrogen use and nitrogen surpluses have been declining, they are still large. The European Commission repeatedly takes infringement cases against Member States who are making insufficient progress in implementing the Nitrates Directive.[256] However, there appears to have been little political will to take stronger action beyond requesting the offending Member State to improve their NVZ designation, their action programmes or pollution monitoring. Although the academic case for pollution taxes on damaging agricultural inputs has often been made[257], the only case of their systematic use in the EU has been the pesticide tax in Denmark.[258]

It is a fact that the domestic environmental standard for nitrogen is not reached in many waters in the UK (and the EU). However, this can be argued as a reason to make the case for applying the same domestic standards to imports, because the absence of such balanced treatment between domestic and imported produce blocks the enforcement of domestic rules. "Such unequal treatment is not fair" is the not unreasonable claim of the farmers. Moreover, there is determination, both in the UK and the EU, to improve this state of affairs through two kinds of action. First, by introducing new policy initiatives, which build on the realisation that there are alternatives available to the polluting, conventional model of agriculture. The second is to widen the case for sustainable farming internationally by introducing the concept of CES. Each will be briefly taken up here.

On the basis of a new emerging consensus on the need to transition away from the twentieth-century model of agriculture towards a more sustainable one, new initiatives are being embraced. These offer different models to significantly diminish the negative environmental footprint of agriculture irrespective of location or the type of agricultural system in place. The first model is sustainable intensification, whereby the power of data, digitisation, GPS mapping and robotics are harnessed to significantly reduce the volume of crop protection products and nutrients

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[256] European Commission (2021), "Report from the Commission to the Council and the European Parliament on the implementation of Council Directive 91/676/EEC concerning the protection of waters against pollution caused by nitrates from agricultural sources based on Member State reports for the period 2016-2019", available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2021%3A1000%3AFIN. This report lists 10 infringement proceedings in this period.

[257] A UK example is by Dieter Helm (2019), "Green and Prosperous Land: A Blueprint for rescuing the British Countryside", Ch. 9 ("Paying for Pollution"), William Collins.

[258] For an account of the Danish Pesticide Tax, see ECOTEC et al., "Study on Environmental Taxes and Charges in the EU", Final Report: Tier 3: Ch. 17: Pesticides, available at: https://ec.europa.eu/environment/enveco/taxation/pdf/ch17_pesticides.pdf

applied to crops, by being much more precise about treatment levels in relation to soil, crop and pest conditions.

The other model is to switch to cropping systems that can be subsumed under regenerative, agro-ecological and indeed organic farming[259] approaches to reduce cropping intensity by relying less on synthetic inputs and more on natural processes for the nutrients and crop protection. The recent National Food Strategy for the UK[260] proposed these two models as two compartments of a three compartment model. The redeployment of agricultural land for forestry, peat restoration and for nature presenting the third of these elements. It should be cautioned that this is "thinking in progress". The two models are not mutually exclusive, as there are elements of each which can be applied to the other. It is clear in the Agriculture Bill for England that support will be made available to help farmers pursue all three of these routes. The enthusiasts for each of the two agricultural production compartments are not convinced by the other approach. Yet, they have in common a recognition that the environmental performance of agriculture, especially with respect to biodiversity and climate, must improve. In particular, they share a vision that a future agricultural system needs to reduce the use and harm from pesticides and excess nutrients. The issue of fair and balanced treatment of imports and domestic production is common to both.

If sensitively approached, the development of a CES for nutrients and pesticides can build on this common ground. Domestic producer interests have displayed considerable nervousness of an expansive liberal UK world trade stance, while environmental groups have feared the implications of a liberalised trade regime on the environment. Working towards applying the same standards to imports should therefore be common ground to both of these groups and could even bring farming and environmental interests closer. Internationally, there are agreed global targets for correcting and reversing biodiversity degradation and seeking net zero GHG emissions by 2050. This should signal that, sooner or later, all countries must have the regulatory basis in place to achieve this goal, and that this might be better done in a transparent way. Arguably, the key towards wide recognition for CES includes openly collaborating on design principles and allowing time and some flexibility in implementation. This will allow CES to be flexible and to allow for CES to be applicable to the widely different agricultural systems and natural operating conditions around the world.

5.2 Areas for further case studies

The case studies examined in this report are intended to explore and illustrate the challenges and opportunities of developing CES to address pressing environmental problems. Two totemic

[259] There are many definitions of agro-ecology and regenerative farming, but neither has national or international certification in the way that organic farming is recognised by regulation and in the market. A useful review of these and numerous other so-called sustainable farming systems is in the IUCN report by Oberč, B.P. and Arroyo Schnell, A. (2020), *Approaches to sustainable agriculture,* available at: https://doi.org/10.2305/IUCN.CH.2020.07.en

[260] National Food Strategy (2021), *An independent review for Government: The Plan*, "Appendix 9: A rural land use framework based on the Three Compartment Model", available at: https://www.nationalfoodstrategy.org.

issues of the negative impact of inappropriate agricultural practices on the environment, which are seen in many farming systems around the world, concern the use of certain pesticides and excess nutrients: the case studies examined in this study. However, there are a number of other areas that would be good candidates for CES. In this section, we provide an overview of areas for further study, focusing on climate change, environmental impact assessments, water stress and deforestation.

5.2.1 Climate change

As one of the two key global environmental challenges, climate change seems a natural candidate for a case study on CES. Globally, the agri-food sector contributes significantly to climate change and environmental degradation. In 2018, agriculture accounted for 17% of global GHG emissions.[261] Given the time lag between emission reduction measures applied and the materialisation in emission cuts achieved, and in view of the slow progress observed to date, agriculture may become the second highest emitting sector by 2050.[262] For this reason, it is widely recognised that climate change targets will not be achieved without successful emissions reduction in this sector.[263] At the same time, agriculture is one of the sectors most vulnerable to the impacts of climate change.[264] This makes it pivotal also to adapt agriculture to climate change and make it more resilient to potentially adverse effects of higher temperatures and volatile weather patterns.

In 2018, globally, agricultural emissions had risen to 9.3 billion tons of CO2 equivalent (CO2eq), of which 5.3 billion tonnes CO2eq originated from non-CO2 emissions of methane and nitrous oxide. About two-thirds of this amount, 3 billion tonnes CO2eq, was caused by livestock production processes.[265] It is wise when considering climate change to bring together both agriculture and the Land Use, Land Use Change and Forestry (LULUCF) sector as there are strong interactions between the two, and because they are the only sectors in the economy that currently have the potential – if appropriately managed – to sequester significant volumes of CO2. At present, however, the global LULUCF sector is a source of CO2, not a sink. The conversion of natural ecosystems, in particular forests and natural peatlands into grassland or arable land for agriculture, globally generated 4 billion tonnes in CO2eq.[266] Looking at the food

[261] FAO (2020), Emissions due to agriculture. Global, regional and country trends 2000-2018, FAOSTAT Analytical Brief Series No 18, Rome, available at: https://www.fao.org/3/cb3808en/cb3808en.pdf.
[262] UK Houses of Parliament, Parliamentary Office of Science and Technology, POSTNOTE 600, May 2019, Climate Change and Agriculture, available at: https://researchbriefings.files.parliament.uk/documents/POST-PN-0600/POST-PN-0600.pdf
[263] Ibid.
[264] Prabhakar, S.V.R.K. and Srinivasan, A. (2010), "Metrics for Mainstreaming Adaptation in Agriculture Sector", *Climate Change and Food Security in South Asia*, pp. 551-567.
[265] FAO (2020), Emissions due to agriculture. Global, regional and country trends 2000–2018, FAOSTAT Analytical Brief Series No 18, Rome, available at: https://www.fao.org/3/cb3808en/cb3808en.pdf.
[266] Ibid.

chain more broadly, an FAO report found that the consumption of fossil fuels along the whole supply chain accounts for about 20% of land-related emissions.[267]

In the UK, for 2019, the agriculture sector contributed 10% of total UK (territorial) GHG emissions amounting to 46.3 Mt CO2eq. This has fallen about 13% since 1990, due mostly to a reduction in fertiliser use and contraction in the cattle and sheep populations. Within these total emissions, agriculture was responsible for 68% of total nitrous oxide emissions, 47% of total methane emissions, and 1.7% of total carbon dioxide emissions, which relate mainly to fuel use.[268] For a sector generating just 0.8% of GDP, agriculture represents a highly GHG-intensive sector. The LULUCF sector in the UK shows quite large fluxes of CO2: rotational grassland is routinely ploughed for arable production and the cultivation of lowland peat both release CO2, this is partly offset by land converted to pasture. Meanwhile, as the UK forest area slowly grows, this removes CO2 from the atmosphere. The overall effect for the LULUCF sector in 2014 was a net sink of 9 Mt CO2eq. In summary, it is evident that the agri-food sector contributes significantly to climate change.

In contrast, it is harder to define relevant environmental standards and policies in place for agriculture and the land use sector in the UK. On a more general level, the national target for climate change is to decarbonise energy production to achieve net zero GHG emissions by 2050, which is anchored in the 2019 Climate Act.[269] Operationally, the UK-wide Committee on Climate Change (CCC) advises the government to achieve this target through the use of five-year carbon emission budgets, on which reports are published annually.[270] The latest (6th) Carbon Budget report states that: "There are no national or UK-wide policies that directly target the reduction of greenhouse gas (GHG) emissions in the agriculture sector. EU regulations, a voluntary approach to reducing on-farm emissions, and grant funding are key existing mechanisms".[271]

As far as agriculture and the LULUCF sectors are concerned, the UK CCC has provided the government with guidance on the elements of climate policy and standards for the agriculture and land-based sectors to contribute to the net zero target.[272] The CCC suggests that the following actions are necessary:

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[267] FAO (2013), *Tackling Climate Change Through Livestock: A global assessment of emissions and mitigation opportunities,* available at: https://www.fao.org/3/i3437e/i3437e.pdf

[268] All figures in this paragraph are sourced from the Defra report on agricultural emissions (Defra (2021), *Official Statistics: Agri-climate Report 2021 – Section 1. UK agriculture estimated greenhouse gas emissions*, available at: https://www.gov.uk/government/statistics/agri-climate-report-2021/agri-climate-report-2021).

[269] UK 2019 Climate Act with the Net Zero 2050 commitment, available at: https://www.theccc.org.uk/the-need-to-act/a-legal-duty-to-act/

[270] Committee on Climate Change (CCC) (2020), "The Sixth Carbon Budget: The UK's path to Net Zero", available at: https://www.theccc.org.uk/publication/sixth-carbon-budget/

[271] CCC (2020), *Policies for the Sixth Carbon Budget and Net Zero*, p. 154, available at: https://www.theccc.org.uk/publication/sixth-carbon-budget/

[272] CCC advice on agriculture and the land-based sector is contained in "Land Use Policies for a Net Zero UK", available at: https://www.theccc.org.uk/publication/land-use-policies-for-a-net-zero-uk/

1. Reduce agricultural emissions of non-CO2 GHG, methane and nitrous oxide as well as CO2, and increase soil carbon.
2. Switch some agricultural land to forestry.
3. Rewet significant areas of upland and lowland peat to switch them from being net emitters to carbon sinks.
4. Switch some land to bioenergy (miscanthus and short rotation coppice (SRC)) with carbon capture and storage.
5. Reduce consumption of livestock products.

The net effect of these proposals is to reduce agricultural and land use emissions by 64%. The agricultural sector would still be emitting non-CO2 GHG, even in 2050, which are to be offset by land use actions that aim to sequester carbon in biomass, and in agricultural and forest soils and peat. It is noted that the CCC calculates that reducing the agricultural area (by switching land to forestry, peat and nature) and de-intensifying some land (by shifting to agro-ecology) without drawing in more food imports cannot be achieved unless consumption per capita is also reduced.[273] The Committee suggests achieving this through the reduction of consumption of livestock products, especially meat and dairy products. There are many other proposals of how the land sector can contribute to UK Net Zero 2050. One proposal is offered by WWF, it suggests less reliance on bioenergy with the as-yet undeveloped carbon capture and storage.[274]

The developments of specific targets and measures by the government for most of these actions is still pending. However, it seems likely that these targets will be implicitly built into the development of the emerging UK agricultural policy framework. It should also be noted that actions will certainly be implemented separately by the devolved administrations. It is furthermore expected that the necessarily land use changes will mostly be induced, rather than regulated, although the mix of private versus public funding of the inducements has not yet been clarified. Public funds might be available to implement actions listed in 2, 3 and 4 above. For England, Defra has started to devise some specific climate-related measures for soil carbon, as laid down in the standards for the Sustainable Farming Initiative, e.g. doing soil testing, having a soil management plan and adding organic matter to soils. In due course, these requirements will form the basis of a list of measures being sought for climate protection. Some authors, such as Helm, advocate that taxes, e.g. on nitrogen, pesticides and carbon, should be used to incentivise action.[275] However, there are no signs that this is being taken up by the UK Government.

A barrier to the adoption of action on agriculture and climate, and therefore in developing CES for climate, is the lack of agreed metrics and clear, detailed standards or specific targets for

[273] Note that the CCC also advocates that there is scope to further increase agricultural productivity to balance the reduction in agricultural areas in view of the still expanding UK population and avoiding the need to draw in more food imports. It could be said that the NFS's Three Compartment Model is therefore broadly consistent with this broad approach by the CCC.

[274] WWF (2022), Land of Plenty Report, https://www.wwf.org.uk/updates/land-of-plenty

[275] See the economist Dieter Helm's book, especially Chapter 9 entitled "Paying for pollution". (Helm, D. (2019), "Green and Prosperous Land: a blueprint for rescuing the British Countryside" (William Collins, London)).

agriculture and climate change. Existing internationally recognised data sources include data collected by the FAO on emissions of agriculture and land use, per country, which are based on country data officially reported to the FAO. However, metrics are needed at a product level to compare the GHG-density of products, and farm-business level GHG net emissions, per farm or per hectare. There are examples of such metrics in development and in use. For GHG-density of products, the work of Poore and Nemecek (2018) is widely quoted[276], which provides a database of indicators on the GHG-intensity of production for a wide range of products in a range of countries. But these are far from being universally adopted and insufficiently detailed for any individual country to base policy. To measure farm-level GHG emissions allowing for sequestration in soil and biomass, there are applications such as the Cool Farm Tool.[277] However, the methodology and their relationship to what has been agreed internationally under the United Nations Framework Convention on Climate Change (UNFCCC), namely, the compilation of territorially based national inventories of GHG emissions by sector, is not agreed. Such tools are therefore valuable for raising awareness amongst farmers about the GHG fluxes associated with their business, but more work is required before they can be used to draw authoritative, internationally recognised international comparisons. This is a significant drawback in the context of their use for CES. Yet, these tools could be important pioneers in pointing the way.

5.2.2 Environmental Impact Assessments (EIAs)

CES may also be applied in the context of requirements on the use of an Environmental Impact Assessment (EIA). EIAs are required for a range of development activities that could have significant negative environmental effects. The legislative basis for these is laid down in the EU Environmental Impact Assessment Directive, initially enacted in 1997 and since amended in 2003, 2007 and 2011. Implementation of the directive is a devolved matter. The English case will be illustrated here.

An EIA typically involves five stages:

- Screening to test if the development is likely to fall within the regulations needing assessment
- Scoping of the issues to be considered
- Preparing the environmental statement
- Making a planning application and consultation
- Decision-making

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[276] Poore and Nemecek (2018). Ibid.
[277] Cool Farm Alliance (n.d.), *Cool Farm Tool: an online greenhouse gas, water and biodiversity calculator for farming*, available at: https://coolfarmtool.org

The situations defined in England for which such an EIA may be required are set out in Table 19.

Table 19. Criteria and thresholds for EIAs in agriculture[278]

Development type	Schedule 2 criteria and thresholds	Indicative criteria and threshold	Key issues to consider
Use of uncultivated or semi-natural land for intensive agricultural purposes	The area of the development exceeds 0.5 ha	Environmental Impact Assessment is unlikely unless it covers more than 5 ha	Impacts on the surrounding ecology, hydrology and landscape
Water management for agriculture, including irrigation and land drainage projects	The area of the works exceeds 1 ha	Permanent changes to the character of more than 5 ha of land	Wider impacts on hydrology and surrounding ecosystems. Environmental Impact Assessment will not normally be required for routine water management projects undertaken by farmers
Intensive livestock installations	The area of new floorspace exceeds 500 m^2	Installations designed to house more than 750 sows, 2,000 fattening pigs, 60,000 broilers or 50,000 layers, turkeys or other poultry	Level of odours, increased traffic and the arrangements for waste handling
Reclamation of land from the sea	All development	Work is proposed on a site which exceeds 1 ha	Wider impacts on natural coastal processes beyond the site itself, as well as to the scale of reclamation works

The details of how this operates for the first case in the table (changes in uncultivated or semi-natural land) are described in the Defra Guidance on EIA (Agriculture) regulations.[279] The

[278] DEFRA (n.d.), *Indicative Criteria and Threshold Key Issues to Consider*, available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/630689/eia-thresholds-table.pdf
[279] Natural England and Defra (2014), *EIA (Agriculture) regulations: Apply to Make Changes to Rural Land*, available at: https://www.gov.uk/guidance/eia-agriculture-regulations-apply-to-make-changes-to-rural-land

changes that need to be accounted for are those that might cause damage by increasing productivity or by physically changing field boundaries. Uncultivated land is defined as land that, for the last 15 years, has not been physically cultivated or chemically disturbed (e.g. by fertilisers or soil improvers). There are strong deterrents for not respecting these rules and abiding by them is also part of the cross-compliance rules for farmers claiming basic payments and in agri-environment schemes (see section 5.2 above). The changes in land management that necessitate an EIA are numerous and set out in the guidance. A farmer wishing to carry out such a change must apply to Natural England for a screening decision. If Natural England considers that the project is likely to have "a significant effect on the environment", then a consent decision must be sought. Constructing the required environmental statement will require the input of an experienced environmental consultant. These procedures will clearly necessitate time and resources. An indication of the scale of the work required is illustrated by the 116-page environmental statement prepared to accompany an application for a proposed large broiler chicken unit.[280]

These measures are in place to protect all aspects of the environment. For field boundary changes, an EIA helps avoid biodiversity damage. In the case of construction of livestock facilities, an EIA is likely to focus heavily on water pollution – and thus biodiversity protection – as well as GHG emissions, especially in relation to the management of wastes and manures. Whether these procedures constitute a potentially interesting case for the development of CES depends, first, on whether agricultural exporting countries have comparable requirements for EIAs, or even any such requirement. Inversely, the question arises whether it could be sensibly argued that an EIA, or an equivalent, should be in place for all produce imported to the UK. If EIAs are in place, a CES could be based upon comparing the stringency of the criteria and thresholds to hold an EIA and the criteria applied. This is likely to have most relevance to the scale and impacts of intensive livestock units for cattle (both dairy and beef), pigs and poultry. Given the importance of livestock emissions both for water quality and their indirect biodiversity impacts, as well as GHG emissions, this certainly would seem to be an area deserving closer examination.

5.2.3 Water stress

Water stress is another area that presents potential avenues to explore with regards to developing a core environmental standard. Water stress refers to a situation in which the demand for water exceeds available stocks for a certain period or when poor quality restricts its use.[281] This leads to the deterioration of freshwater resources in terms of quantity and quality.[282] Only 3% of the

[280] An example environmental statement, available at: https://www.rogerparry.net/wp-content/uploads/2021/07/EIA-2.pdf
[281] EEA (n.d.), *Water Stress – European Environment Agency*, available at: https://www.eea.europa.eu/archived/archived-content-water-topic/wise-help-centre/glossary-definitions/water-stress
[282] Ibid.

world's water is freshwater, with two-thirds of this stored in glaciers and the rest not suitable for human consumption.[283] As a result of human activity and accelerating climate change, many water systems such as rivers, lakes and aquifers that are essential to human and ecosystem survival are increasingly stressed.[284]

Water pollution is a major contributor to water stress originating from various sources, such as pesticides, fertilisers and industrial waste, contaminating even groundwater supplies. Agriculture contributes greatly to non-point-source pollution of both surface and groundwater. Agricultural intensification has furthermore been accompanied by increased salinity, soil erosion and eutrophication in water systems, as documented earlier in the context of the nitrates case study.

Another aspect of water stress that is equally of concern is that of water scarcity. Water scarcity can be separated into two categories:[285] (i) physical scarcity: water shortages due to local environmental conditions; and (ii) economic scarcity: inadequate water infrastructure to support various needs and requirements for water.

Agriculture has been described as both "a victim and a cause of water scarcity".[286] The agricultural sector is the largest user of water globally and accounts for nearly 70% of global water withdrawals (FAO) with nearly 60% of this lost through leaky irrigation systems and using the wrong application methods.[287]

Crop production is largely dependent on infiltrated rain from soil (green water), which accounts for 84% of global agricultural water consumption, while supplemental irrigation (blue water) accounts for 16% of global consumptive water use in agriculture.[288] Climate and soil-related factors are significant contributors to water scarcity, however, anthropogenic activity is also accelerating these phenomena. This includes soil mismanagement on farms, water crowding (which refers to population-driven shortages) and poor mobilisation of water resources due to inadequate infrastructure.[289]

Water stress varies significantly from region to region and has wide-ranging impacts that touch on public health, global trade and economic development. Globally, there are certain regions that are more water-stressed than others. Physical scarcity is most acute in the Middle East and North Africa (MENA) region, as countries in this region receive less rainfall on average and feature many densely populated urban centres with ever growing water requirements.[290]

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[283] WWF (n.d.), *Threats – Water Scarcity*, available at: https://www.worldwildlife.org/threats/water-scarcity#:~:text=When%20waters%20run%20dry%2C%20people
[284] Ibid.
[285] Felter, C. and Robinson, K. (2021), *Water Stress: A Global Problem That's Getting Worse*, Council on Foreign Relations, available at: https://www.cfr.org/backgrounder/water-stress-global-problem-thats-getting-worse
[286] Dankova, R. (2016), *Agriculture Holds the Key to Tackling Water Scarcity*, World Bank Blogs, available at: https://blogs.worldbank.org/water/agriculture-holds-key-tackling-water-scarcity
[287] WWF (n.d.). Ibid.
[288] Falkenmark, M. (2013), "Growing Water Scarcity in agriculture: Future Challenge to Global Water Security", *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*, 371:20120410, available at: http://dx.doi.org/10.1098/rsta.2012.0410.
[289] Ibid.
[290] Felter and Robinson (2021). Ibid.

Conversely, wealthier countries that face physical water scarcity have systems in place to alleviate their need for water. For example, the United Arab Emirates bypasses this problem by importing nearly all of its food. Other countries in the region utilize desalination technologies on ocean resources.[291]

With regards to the UK, domestic policies to tackle water pollution such as the Nitrates Directive have been discussed at length in the nutrients case study. However, as water stress encompasses both quality and quantity, it is critical to examine the UK's domestic policies on physical and economic water scarcity. In a similar vein to the designations of NVZs, the UK Environment Agency has also made designations of regions under severe water stress ("water stress determinations") due to pressures from over-abstraction, population growth and climate change.[292]

The main policy framework that addresses water scarcity is the National Framework for Water Resources and Water Resources Management Plans by water companies. As climate change and population growth will result in greater water requirements, this may also affect Scotland, Wales and Northern Ireland. In 2019, Sir James Bevan, Chief Executive of the Environment Agency stated that "within 25 years England will not have enough water to meet demand"[293] if serious action is not taken urgently.

In 2020, the National Framework for Water Resources was published, which "explores the long-term needs of all sectors that depend on a secure supply of water, which includes public water supplies provided by water companies to homes and businesses; direct abstraction for agriculture, electricity generation and industry; and the water needs of the environment".[294] According to the National Framework for Water Resources, if urgent action is not taken between 2025 and 2050, then close to 3,435 million extra litres could be required each day to address future demand. The study also points to the fact that around 700 million litres per day of water, which is retrieved from unsustainable abstractions, will need to be replaced between 2025 and 2050 to mitigate serious water insecurity.[295]

While the UK has been noted to use less water for farming compared to the global average, climate change causing hotter and drier weather could necessitate the need for more supplemental irrigation to maintain crop yields. This will likely strain the domestic water supply.[296] Most crops grown in the UK are rainfed, however, rainfall patterns vary greatly across

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[291] Ibid.

[292] ENDS Report (2021), *MAPPED: England's Seriously Water Stressed Regions*, available at: https://www.endsreport.com/article/1721177/mapped-englands-seriously-water-stressed-regions#:~:text=In%20the%20previous%202013%20determination

[293] Heggie, J. (2020), *Water, water everywhere?*, National Geographic, available at: https://www.nationalgeographic.co.uk/environment-and-conservation/uks-looming-water-crisis

[294] Environment Agency (2020), *Meeting Our Future Water Needs: A National Framework for Water Resources*, available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/873100/National_Framework_for_water_resources_summary.pdf

[295] Ibid.

[296] Heggie, J. (2020). Ibid.

the country, both seasonally and annually.[297] Although the UK does indeed use less water for its domestic agriculture than the global average, because it imports about half of its food it has a high international water footprint. The UK consumes many diverse products, including large quantities of livestock products, tea, cereals, sugar and cotton, originating from all over the world.[298]

The UK is only 38% self-sufficient in water, and thereby requires 62% of its water to be sourced from elsewhere. It is also the sixth largest net importer of virtual water based on the water footprint of its agricultural imports. The UK certainly imports more water-intensive agricultural products than it exports.[299] It has also been observed that about half of the UK's consumption-water footprint is associated with imports from water scarce countries.[300] About 55% of the UK's unsustainable blue water footprint is located in six countries: Spain, USA, Pakistan, India, Iran and South Africa (all countries with varying degrees of physical and economic water scarcity, ranging from moderate to critical).[301] This further exacerbates the issue of offshoring environmental harm, as the UK imports nearly 50% of its food requirements, and domestic water shortages may result in importing irrigated produce from countries that may not have the capacity to manage their water resources efficiently and sustainably.[302]

As a candidate for a CES, water stress presents numerous opportunities and challenges. One of the main challenges lies in establishing appropriate metrics that can be applied broadly. Water stress has multiple causes ranging from population growth and land use to climate change. As a result, there will be regional variabilities to be taken into consideration. Another challenge in establishing the right metrics is poor reporting by countries on water data. It has been observed that identifying a standard threshold level for water stress has been a difficult exercise[303], as physical scarcity may not cause water stress in the presence of adequate infrastructure. Likewise, a country may have sufficient water resources but poor distribution will result in water stress, meaning that the availability for use is diminished.

In light of this, a conventional approach adopted by UN Water has been to set the threshold level at an upper limit of 25%, meaning that values below this are considered safe (i.e. no water

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[297] Knox, J.W., Kay, M.G., Holman, I.P. and Hess, T.M. (2020), *Irrigation Water Strategy for UK Agriculture and Horticulture*, available at: https://www.nfuonline.com/archive?treeid=141830

[298] Chapagain, A. and Orr, S. (2008), *UK Water Footprint: the impact of the UK's food and fibre consumption on global water resources Volume two: appendices Contents*, available at: https://www.wwf.org.uk/sites/default/files/2008-01/uk_waterfootprint_v2.pdf

[299] Ibid.

[300] Feng, K., Hubacek, K., Minx, J., Siu, Y.L., Chapagain, A., Yu, Y., Guan, D. and Barrett, J. (2010), "Spatially Explicit Analysis of Water Footprints in the UK", *Water*, 3(1), pp. 47-63, available at: Water | Free Full-Text | Spatially Explicit Analysis of Water Footprints in the UK (mdpi.com).

[301] Hoekstra, A.Y. and Mekonnen, M.M. (2016), "Imported Water risk: the Case of the UK", *Environmental Research Letters*, 11(5), p. 055002, available at: Imported water risk: the case of the UK - IOPscience.

[302] Knox et al. (2020). Ibid.

[303] FAO and UN Water (2021), *Progress on Level of Water Stress*, available at: https://www.unwater.org/app/uploads/2021/08/SDG6_Indicator_Report_642_Progress-on-Level-of-Water-Stress_2021_ENGLISH_pages-1.pdf.

stress) while values above this should be considered water stressed.[304] However, the scientific community has not reached consensus on the most accurate metrics for water stress as measurements tend to be imprecise, particularly measurements on groundwater stress.[305] Other varying figures for threshold levels have been suggested such as a reduction of 40-50% globally, although, still, this has not reached a consensus.[306] Also, when looking at water stress through the planetary boundary framework, while agriculture has been identified as a sector that has contributed to exceeding the water planetary boundary[307], there are still no scientifically agreed upon approaches to address the water footprint of agriculture, largely as a result of the failure to establish an absolute target and the political practicability of said target.[308] It may thus be concluded that water stress is a relevant issue for further examination.

5.2.4 Products linked to deforestation

Another potential case study that deserves further exploration concerns products linked to deforestation. In 2020, Earth lost nearly 4.2 million hectares of tropical forest cover, with half of that loss attributed to the production of commodity crops.[309] It is estimated that 70% of plant species and land animals live in forests, thus making deforestation an urgent existential threat for many of these species.[310] Forests also provide the essential ecosystem service of carbon sequestration and are important carbon sinks by reducing the amount of GHGs that are released into the atmosphere.[311] Agricultural expansion is responsible for nearly 90% of global deforestation[312], and growing demand for commodity crops, such as soy, palm oil, cocoa and coffee, has led to accelerating rates of forest conversion for agriculture.[313] Animal agriculture,

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[304] Ibid.
[305] Felter and Robinson (2021). Ibid.
[306] ETH Zurich (2020), *Database for Analyzing Environmental Footprints and Green Economy Progress*, available at: https://istp.ethz.ch/news/2020/10/database-for-analyzing-environmental-footprints-and-green-economy-progress.html
[307] Leng, G. and Hall, J.W. (2020), "Where Is the Planetary Boundary for Freshwater Being Exceeded Because of Livestock farming?", *Science of the Total Environment*, p. 14403, available at: Where is the Planetary Boundary for freshwater being exceeded because of livestock farming? - PubMed (nih.gov).
[308] ETH Zurich (2020). Ibid.
[309] NASA Earth Observatory (2021), *Sizing up How Agriculture Connects to Deforestation*, available at: https://earthobservatory.nasa.gov/images/148674/sizing-up-how-agriculture-connects-to-deforestation.
[310] Pachamama Alliance (2019), *Effects of Deforestation*, available at: https://www.pachamama.org/effects-of-deforestation#:~:text=The%20loss%20of%20trees%20and
[311] FAO (2021a), *COP26: Agricultural expansion drives almost 90 percent of global deforestation*, PRD-Newsroom, available at: https://www.fao.org/newsroom/detail/cop26-agricultural-expansion-drives-almost-90-percent-of-global-deforestation/en
[312] Ibid.
[313] WWF (2020), *What Is Forest Conversion?*, available at: https://wwf.panda.org/discover/our_focus/forests_practice/deforestation_causes2/forest_conversion/

that is, livestock and animal feed, is also a major driver of deforestation and a significant contributor to the expansion of our terrestrial footprint.[314]

The UK has a significant overseas footprint generated from importing high-risk commodities such as soy, palm oil, coffee and cocoa. In 2019, the Global Resource Initiative Taskforce recommended to develop mandatory due diligence obligation on businesses to "analyse the presence of environmental and human rights risks and impacts within their supply chains, take action to prevent or mitigate those risks, and publicly report on actions taken and planned." Following this, the UK government introduced its due diligence law through the Environment Act 2021, which places requirements on companies that use forest risk commodities to conduct thorough due diligence on their supply chains to ensure that their products are free from illegal deforestation and conversion.[315] The UK has developed a framework to address deforestation, however, the details on the operationalisation of this law has been left to secondary legislation.[316] These secondary regulations will address the list of specific forest risk commodities.[317]

Defra held consultations to determine the seven commodities under consideration for inclusion into the list of forest risk commodities, which include cattle (beef and leather), cocoa, coffee, maize, palm oil, rubber and soy.[318] Defra has also sought feedback on where to set the turnover threshold for UK businesses for which these regulations will apply, ranging from £50-200 million.[319] For businesses with operations outside of the UK, they may also be regulated based on their turnover as related to UK activity as well as their global turnover.[320]

The UK has adopted a legality approach in its deforestation commitments. The decision for UK legislation to only cover illegal deforestation, and not legal deforestation (different to the approach that the EU has taken), has been subject to several criticisms. The legal context in countries with high rates of deforestation is complex, comprising many norms and regulations that govern land use.[321] Additionally, the persistent lack of traceability and transparency in supply chains and data on land conversion represent challenges for companies to comply with these regulations.[322] It has been noted that between 2021-2030, UK supply chains could be responsible

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[314] World Resources Institute (n.d.), *Deforestation Linked to Agriculture – Global Forest Review*, available at: https://research.wri.org/gfr/forest-extent-indicators/deforestation-agriculture
[315] McCormack, C., Williamson, J. and Schreiber, W. (2022), *Due Negligence Report*, available at: https://www.wwf.org.uk/what-we-do/due-negligence-report
[316] Ropes & Gray LLP (2022), Pending and Proposed Deforestation Legislation Will Add New Supply Chain Due Diligence and Reporting Requirements – an Overview of UK, EU and US Federal and State Initiatives, available at: https://www.ropesgray.com/en/newsroom/alerts/2022/March/Pending-and-Proposed-Deforestation-Legislation-Will-Add-New-Supply-Chain-Due-Diligence
[317] Ibid.
[318] Ibid.
[319] Ibid.
[320] Ibid.
[321] Center for International Forestry Research (CIFOR) Forests News (2016), *How Deforestation Is Tangled up in the Law*, available at: https://forestsnews.cifor.org/40763/how-deforestation-is-tangled-up-in-the-law?fnl=
[322] Ibid.

for the conversion of 36-59,000 hectares of natural vegetation and, within this area, over 70% of deforestation could be legal.[323]

While the environmental case for a CES is clear, a question would be how such a CES would relate to the evolving due diligence approach to address deforestation.

5.3 Developing country considerations

From a climate justice perspective, developing CES for agri-food products raises a number of fairness questions that echo concerns raised by developing countries in international negotiations on climate change. Should developing countries have to pay for environmental problems created predominantly by the developed world? For example, the problem of nitrogen excess is mostly the result of excessive fertiliser use in the more developed and transition economies. Would it be fair to consequently impose regulatory requirements on agri-food products from developing countries whose agricultural systems operate at a far lower intensity and, consequently, give arise to much less environmental pressure?

There are different ways in which fairness-related concerns can be taken into account in the CES. For example, this can be reflected in the design of the CES. For example, by focusing CES targets on the largest environmental impacts, those countries or products that pose a high risk for their contribution to the environmental problem at large could be prioritized. For example, this could mean, in the case of a CES for nitrogen, that measures will be applied only to countries with high-risk NVZs. These are found in regions of many parts of the world – the Americas, South Asia, and North and East Africa.[324]

Similarly, the design of the measure must leave enough scope to take into account different conditions and characteristics in developing countries. This would mean, in the context of establishing regulatory equivalence for NVZs, that local conditions such as soil, surface and slopes are taken into account. Indeed, it will likely not be possible or reasonable to request developing country farmers to comply with the exact set of regulatory requirements to which farmers in the UK are subject. These are often based on a UK/EU-specific risk assessment and tailored specifically to local conditions and temperate zone farming systems. This issue has already been addressed in the context of the legal analysis regarding the concern of "even-handedness". This is important in order to ensure that CES will not result in another obstacle preventing developing country commodities from entering the UK market.

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[323] McCormack et al. (2022), *Due Negligence Report*, available at: https://www.wwf.org.uk/what-we-do/due-negligence-report

[324] San Martín, W. (2020), "Global Nitrogen in Sustainable Development: Four Challenges at the Interface of Science and Policy", in Leal Filho et al. (eds.), Life on Land, Encyclopaedia of the UN Sustainable Development Goals (Springer, Cham.), available at: Global Nitrogen in Sustainable Development: Four Challenges at the Interface of Science and Policy | SpringerLink

The CES can also reflect developing country concerns by building in exceptions for developing countries, where warranted. These exceptions can be time-limited and would have to be reviewed in order for them to be renewed.

In addition, the UK would have a responsibility to provide assistance to ensure that developing countries can meet CES. CES may raise the cost of production for many farmers in developing countries. The specific implications for developing countries will differ, depending on the type of practice the measure seeks to regulate, and depending on the way the measure is designed. For example, imposing lower MRLs on various neonicotinoids on exporting countries will likely raise the cost of production and lower production yields. Imposing more stringent regulatory requirements for nitrogen use could have similar effects. The question, then, is where to draw the line between ensuring continued agricultural yields and production in developing countries while, at the same time, protecting the environment.

Assistance must include both financial and technical assistance. Technical assistance must be tailored to the challenges created as a result of the CES. One such area concerns the issue of data collection. If, with respect to neonicotinoids, import tolerance requests must be based on a scientific assessment establishing negligible risk to bee populations, a key problem relates to the fact that many developing countries lack the data to generate such an assessment. As a result, these countries will not be able to be considered for higher import tolerances if warranted by the specific conditions in the country.

Technical assistance would also be warranted to enhance developing country farmers' access to alternatives to synthetic pesticides, and to develop farm management techniques that apply appropriate amounts of fertiliser. This could be done by supporting developing countries' extension services programmes, for example, but also by ensuring availability of alternative pest control methods, including biocontrol.

The principle of providing technical assistance to developing countries is enshrined in the provisions of WTO agreements. Specifically, in the context of the SPS Agreement, "Members agree to facilitate the provision of technical assistance...". It further specifies that such assistance could be in:

Areas of processing technologies, research and infrastructure, including in the establishment of national regulatory bodies, and may take the form of advice, credits, donations and grants, including for the purpose of seeking technical expertise, training and equipment to allow such countries to adjust to, and comply with, SPS measures necessary to achieve the appropriate level of sanitary and phytosanitary protection in their export markets.[325]

An example of specific technical assistance is provided by the EU through the Europe-Africa-Caribbean-Pacific Liaison Committee (COLEACP). This includes a Pesticides Initiative Programme, which aimed to ensure that the African, Caribbean and Pacific (ACP) producers were not left behind by EU MRL regulations.[326] Other programmes that provide this type of

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[325] SPS Agreement, Article 9.
[326] Matthews (2022). Ibid.

assistance include the WTO's Standard and Trade Development Facility (STDF), a WTO initiative that assists developing countries in developing and meeting standards that improve food safety, and animal and plant health. Similar types of technical assistance could be undertaken to assist developing countries in meeting environmental standards in agri-food production.

Another critical element of a just transition concerns providing adequate transition periods for developing countries. Indeed, developing countries cannot be expected to adjust to the elimination of a particular pesticide, or to limit the use of a fertiliser, within short timeframes such as six months (the standard practice adopted by the EU when changing MRLs). The principle of ensuring a phased introduction of developing countries is also set out in the SPS Agreement, which notes that "longer time-frames for compliance should be accorded on products of interest to developing country Members so as to maintain opportunities for their exports."[327]

For most of these areas of technical assistance, it is critical that the development of CES build in time for consultation with developing countries, and that the design of CES takes into account specific concerns raised. Indeed, the TBT Agreement and the SPS Agreement have built in consultation requirements for when Members develop and announce a new SPS or TBT regulation.[328] Specifically, it would be important to consult with the exporting developing countries what a reasonable timeframe would be to serve as a transition period. A reasonable timeframe may be different for different crops, pesticides or fertilisers.[329]

Finally, it should be noted that above and beyond the design of the measure itself, CES should be embedded in a broader political strategy towards promoting the economic participation of developing countries in world trade, enhancing poverty reduction and supporting countries to adapt and build resilience to climate change. A number of issues may be emphasized in this respect. As highlighted by the United Nations Conference on Trade and Development (UNCTAD), climate change and the political commitment towards the Paris Agreement will make it the more urgent for commodity-dependent developing countries to diversify their productive capacity while advancing the decarbonisation of the sector. For the UK, a starting point would be to assess how to better avenues to more effectively mainstream its development cooperation and sustainable development commitments across its trade and foreign policy framework.

Another consideration relates to the fact that small-scale producers in developing countries are, in many cases, already in practice excluded from agri-food trade opportunities owing to their problems in accessing global markets. Many smallholders might, in theory, be able to benefit from stricter environmental performance requirements (depending on the design of the CES), as many are already producing with lower pesticide and nutrient inputs. However, it will necessitate a broader strategy to improve market access and reduce trade barriers in order to allow these producers to benefit from CES. The UK is already engaged in a number of relevant

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[327] SPS Agreement, Article 10.
[328] See e.g. SPS Agreement.
[329] Matthews (2022). Ibid.

initiatives: as part of its engagement on Aid-for-Trade, the UK supports the work of Trademark (Trade and Markets) East Africa, which promotes market access, trade environment, business competitiveness and sustainable trade.[330] Another relevant example relates to the UK's engagement to foster uptake of green investment in developing countries through its development finance institution, CDC Group.[331] Continued and strengthened support of the UK for these and similar initiatives will be crucial to support market access for small-scale and vulnerable producers and promote sustainable agriculture in developing countries.

In sum, there are number of ways in which the CES measure can be designed to take into account developing country considerations. Regulators should furthermore ensure that CES is embedded in broader political strategy towards promoting sustainable development in in developing countries.

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[330] TradeMark East Africa (n.d.), *Who We Are*, available at: Who we are - TradeMark East Africa (accessed 9 May 2022).

[331] Mizner, A. (2022), *UK Promises Investment in Africa's Green Revolution*, ALB Legal and Business Issues from Africa, available at: https://iclg.com/alb/17548-uk-promises-investment-in-africa-s-green-revolution (accessed 9 May 2022).

6. Conclusion

Against the backdrop of ongoing discussions in the UK about developing CES for imported agri-food products, this study has developed case studies to demonstrate whether, and how, this can be done with respect to key environmental challenges, i.e. the issues of neonicotinoids in pesticides and the excessive use of nitrogen, which leads to eutrophication. The detailed exercise has improved our understanding of both the opportunities and challenges involved in developing CES. We conclude with a number of key takeaways.

In developing CES, it is important to focus on issues of global environmental concern, essentially climate protection and nature protection, i.e. issues relevant to biodiversity. Environmental problems associated with specific territories, such as NVZs, would still be linked to global environmental concerns given the problems associated with global nitrogen pollution and global biodiversity loss. However, attempting to devise and impose CES for purely local environmental challenges, such as local water pollution where there is little basis for transboundary impacts or threat to the global commons, is unlikely to succeed. Imposing CES on imported agri-products will be of little relevance to the local environmental problem. Moreover, CES for local environmental problems could have legal implications with respect to concerns about extraterritoriality.

This report has demonstrated that developing CES to level the playing field between domestically produced food and imported food applies with equal force to existing trade flows as it does to potential new flows that will arise as the UK's trade policy changes following Brexit (i.e. the displacement of EU exports by exports from third countries with lower environmental standards). The UK already has a large external environmental footprint so it should be as focused on reducing that as it is on preventing it becoming larger.

Also, the process of defining CES begins from the regulatory base – the environmental legislation in place. This generally provides the broad statements of environmental objectives. The detailed implementation of these objectives as they impinge on agriculture is then administered through multiple agricultural policy instruments and measures. For the farmer, the key practical expression of the standards to be followed in day-to-day management are the industry-agreed standards – in the UK, the widest of which is the Red Tractor certification process, which builds in the policy requirements. Furthermore, it is commonly the case that the mix of practical policy measures are designed to assist achievement of multiple environmental objectives. This makes it analytically difficult to list the specific standards in place in relation to a specific environmental challenge. This is well illustrated by the nutrients case.

The practical expression of the environmental legislative base in the UK is in a state of flux. UK environmental law is currently switching from the EU regulations and directives to the UK's own legislative instruments; two important ones for England being the Environment and Agriculture Acts. Corresponding legislation is in preparation on the devolved territories. Whether there will be divergence from the EU in environmental objectives and standards, and how the policy measures to implement those standards will adapt and change, remains to be seen. In the meantime, the case studies have been based on the status quo (mostly EU regulations) and the evolving implementing policies, which mostly relate to England.

Generally speaking, defining a CES will be more difficult when the environmental standards are specified in broad statements that include several policies with multiple intervention measures to enforce those standards. For example, this is the case for nitrogen. In these circumstances, it is challenging to extract the exact set of regulatory requirements to which UK farmers are subject. To expand, in the context of the nutrients case study, it was hoped that restrictions in nutrient applications based on crop requirements and expressed as Kg N applied per hectare (which is the key principle underlying the application of the Nitrates Directive) might provide a quantitative basis from which to compare the stringency of regulation in other countries. In practice, there is no single limit on nitrogen applications in the UK but rather a complex guidance framework allowing for a wide range of applications of both mineral fertiliser and organic fertilisers like manures and sewage waste depending, *inter alia*, on the crop, previous cropping, soil type and conditions. To compare this with the controls in other countries requires close study of the farming systems, practices, and regulations and how they are applied. This makes it analytically complex to draw conclusions about the stringency and environmental effectiveness of the regulatory frameworks in other countries compared with the UK standard.

The indicator of the UK standard identified to develop a legal analysis was the existence of an evidence-based system of NVZs and the restrictions in place within those zones. Another element that could be added is whether there is in place a requirement on farmers to conduct, follow and record a detailed nutrient management plan. Beyond these quasi-binary indicators is the task of comparing the length and coverage of the detailed operational rules for nutrient management on farms. Comparing these will necessarily involve an element of judgement, making this very challenging.

In cases such as for nitrogen, given the complexity of environmental regulation and its implementing agricultural policies, which define the operational environmental standard operating in each of the areas investigated, there were insufficient resources to research the corresponding regulations and policies in competing exporting countries. It was therefore not possible in this study to judge the existence or extent of regulatory gap and their potential environmental consequences. This is a knowledge gap that should be filled in any future development of CES.

This report has also demonstrated the importance of the design of the CES. It has highlighted how the CES could be designed to reflect key WTO principles, including by ensuring that the CES allows for flexibility to take into account relevant conditions and characteristics of the exporting country. Requiring that exporting countries comply with standards identical to those applicable to UK producers would typically not allow for export conditions to be taken into account. A key challenge here would be the determination of equivalence between different regulatory regimes – an area that is beyond the scope of this paper and should be further researched with respect to specific environmental issues.

The legal analysis further emphasises the importance of ensuring that the CES is necessary to achieve the objective that the measure intended to set out, and that there is a link between the environmental objective pursued and the UK's territory. This could be done by pointing to global environmental problems, as well as by framing the focus of the measure on the basis of UK citizens' public morals.

This report has emphasised the importance of taking into account developing country considerations in the development of CES in order to ensure a just transition. On the one hand, this means ensuring that the CES is sufficiently flexible to take into account developing countries' situations and, on the other hand, it means ensuring that the UK provides various types of technical assistance and capacity building, including in areas relevant to data assessments and analysis, extension services and other types of training. Moreover, building in a gradual transition period, and ensuring that developing countries are consulted in development of the CES, is critical.

By providing a deep-dive into some key issues associated with CES, this report seeks to further advance the discussions regarding the design of CES and their applicability to imported agri-food products. However, this report is by no means intended to be comprehensive or conclusive. Rather, the hope is that the findings presented here may be used as the basis for further research and analysis that is necessary in making CES a reality.

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