

Sustainability Insights Risk Assessment Summary Methodology – 2025 version

Valerie Janssen, Nina Bellini Motovska, Jeroen Weststrate, Michiel van Eupen, Quinta Bonekamp,
Miriam Vreman, Annabel Oosterwijk, Arun Pratihast, Birgit de Vos



WAGENINGEN
UNIVERSITY & RESEARCH



Sustainability Insights Risk Assessment Summary Methodology – 2025 version

Valerie Janssen¹, Nina Bellini Motovska¹, Jeroen Weststrate¹, Michiel van Eupen², Quinta Bonekamp¹,
Miriam Vreman¹, Annabel Oosterwijk¹, Arun Pratihast², Birgit de Vos¹

1 Wageningen Social & Economic Research

2 Wageningen Environmental Research

This methodology was developed by Wageningen Social & Economic Research and Wageningen Environmental research, as a part of a 4-year public-private partnership, which and was financed by IDH, Olam Agri, Olam Food Ingredients, The Port of Amsterdam, Syngenta and Acom (year 1 only), and which was subsidized by the Dutch Ministry of Agriculture (project code: BO-69-001-006). This is a preliminary version of the methodology, before incorporation of feedback from external reviewers. A new version is expected in the first half of 2026.

Wageningen Social & Economic Research
Wageningen, November 2025

REPORT
2025-A023

Valerie Janssen, Nina Bellini Motovska, Jeroen Weststrate, Michiel van Eupen, Quinta Bonekamp, Miriam Vreman, Annabel Oosterwijk, Arun Pratihast, Birgit de Vos, 2025. *Sustainability Insights Risk Assessment Summary Methodology – 2025 version*. Wageningen, Wageningen Social & Economic Research, Report 2025-A023. 122 pp.; 10 fig.; 45 tab.; 32 ref.

Wageningen University & Research has developed a tool with the aim of providing insights into the environmental and social risks of agricultural trade flows at different geographical levels. This document provides a summary of the methodology that is used in the tool and the decisions that are made during the development of the methodology.

Key words: Sustainability insights, corporate sustainability due diligence, human rights risk, environmental risks

This report can be downloaded for free at <https://doi.org/10.18174/704304> or at <http://www.wur.eu/social-and-economic-research> (under Wageningen Social & Economic Research publications).

© 2025 Wageningen Social & Economic Research

P.O. Box 88, 6700 AB Wageningen, The Netherlands, T +31 0317 48 48 88, E info.wser@wur.nl, <http://www.wur.eu/social-and-economic-research>. Wageningen Social & Economic Research is part of Wageningen University & Research.



This work is licensed under a Creative Commons Attribution-Non Commercial 4.0 International License.

© Wageningen Social & Economic Research, part of Stichting Wageningen Research, 2025

The user may reproduce, distribute and share this work and make derivative works from it. Material by third parties which is used in the work and which are subject to intellectual property rights may not be used without prior permission from the relevant third party. The user must attribute the work by stating the name indicated by the author or licensor but may not do this in such a way as to create the impression that the author/licensor endorses the use of the work or the work of the user. The user may not use the work for commercial purposes.

Wageningen Social & Economic Research accepts no liability for any damage resulting from the use of the results of this study or the application of the advice contained in it.

Wageningen Social & Economic Research is ISO 9001:2015 certified.

Wageningen Social & Economic Research Report 2025-A023 | Project code 2382500479

Cover photo: TZIDO SUN / Shutterstock.com

Contents

Summary	5
1 Introduction	6
1.1 Due Diligence Legislation and WUR Methodology	6
1.2 Overview of Human Rights and Environmental risk themes	8
2 Human rights risk assessment methodology	10
2.1 General approach: steps and scoring	10
2.2 Overview of indicators and score per human rights theme	11
2.3 Detailed methodology for calculating commodity-specific final risk scores per theme	12
2.3.1 General guidelines on indicators, data selection criteria and weights	12
2.3.2 Steps in calculating the human rights risk scores	14
2.4 Theme-specific information	25
2.4.1 Child labour	25
2.4.2 Forced labour	31
2.4.3 Discrimination	37
2.4.4 Violence and harassment	43
2.4.5 Freedom of association and collective bargaining	47
2.4.6 Occupational health and safety	52
2.4.7 Insufficient remuneration	56
2.4.8 Access to land and material resources	59
3 Environmental risks assessment methodology	66
3.1 Life Cycle Assessment (LCA)	67
3.1.1 General approach: steps and scoring	67
3.1.2 Detailed methodology for calculating LCA-based risk scores per product country combination	68
3.1.3 Theme-specific information	81
3.2 Steps in calculation spatial risk scores	82
3.3 Theme-specific information for spatial risk scoring	86
Sources and literature	95
Appendix 1 Forced labour adjusted Government Response Score method	97
Appendix 2 Criteria for data reliability during commodity risk score assessment (standardised literature review)	100
Appendix 3 Dealing with data availability during commodity risk score assessment	101
Appendix 4 Comparison between Anker & Anker and Wage Indicator benchmarks for the calculation of the living income deficit	102
Appendix 5 Selected variables for 'Workplace discrimination (WPC)' and 'Social institutions and gender discrimination (GID-DB)' indicators (Discrimination theme)	103
Appendix 6 Selected variables for 'Legal protection from (sexual) harassment and violence (WPC)' & 'Lloyd's register selected indicators on occupational violence' (Violence & harassment theme)	112
Appendix 7 Data sources environmental risks (spatial themes)	115
Appendix 8 Interpretation of final human rights risk scores	117



Summary

To achieve a climate neutral and green economy, as well as to achieve the UN Sustainable Development Goals, the European Commission has developed a legislative framework that requires companies to identify and prevent, mitigate and account for actual and potential adverse impacts within their operations, supply chains and business relationships. Wageningen University & Research has developed a tool with the aim of providing insights into the environmental and social risks of agricultural trade flows at different geographical levels. This document provides a summary of the methodology that is used in the tool and the decisions that are made during the development of the methodology. Its purpose is to transparently present the background information underpinning the risk scores featured in the WUR Due Diligence Dashboard for score users, researchers, consultants working on related topics, and other interested stakeholders. The scores generated by this methodology can be accessed on the Due Diligence Dashboard website.¹ Please note that this is a preliminary version of the methodology, before incorporation of feedback from external reviewers. A new version is expected in the first half of 2026.

¹ <https://www.wageningenfoodviews.com/>

1 Introduction

1.1 Due Diligence Legislation and WUR Methodology

In recent years the European Union has developed different legislative proposals to achieve a climate neutral and green economy, to achieve the UN Sustainable Development goals, and foster sustainable and responsible corporate behavior. Specifically, the Corporate Sustainability Reporting Directive (CSRD),ⁱ EU Deforestation Regulation (EUDR),ⁱⁱ Corporate Sustainability Due Diligence Directive (CSDDD),ⁱⁱⁱ Forced Labour Regulation (FLR)^{iv} and EU Taxonomy^v place a range of social and environmental sustainability impacts at the center of new legislative requirements for businesses operating in the EU. Furthermore, this legislation requires companies not only to consider impacts directly related to their business but also consider the impacts in their value chain (e.g. associated with its direct and indirect business partners). Similar legislative proposals are also being developed across the world (e.g. USA and Canada).

The concept of Due Diligence -as operationalised by the UN Guiding Principles (2011)^{vi} and the OECD (2011,^{vii} 2018,^{viii} 2023)^{ix}- has a central place in all these aforementioned legislations. The concept stresses the responsibility of companies to identify, prevent, mitigate and account for how they address actual and potential adverse impacts² in their operations, supply chains and other business relationships.³ The OECD Guidance (2018), together with the UNGPs and certain sector-specific guidance, currently provides the most comprehensive framework recognised by the EU legislator for carrying out a due diligence process (see Figure 1 for overview of OECD due diligence process). This process involves systematically identifying, preventing, mitigating, and accounting for actual and potential adverse impacts in business operations and supply chains. Furthermore, globally 46 countries (amongst which 25 EU member states) formally adhere to the OECD Guidelines.⁴

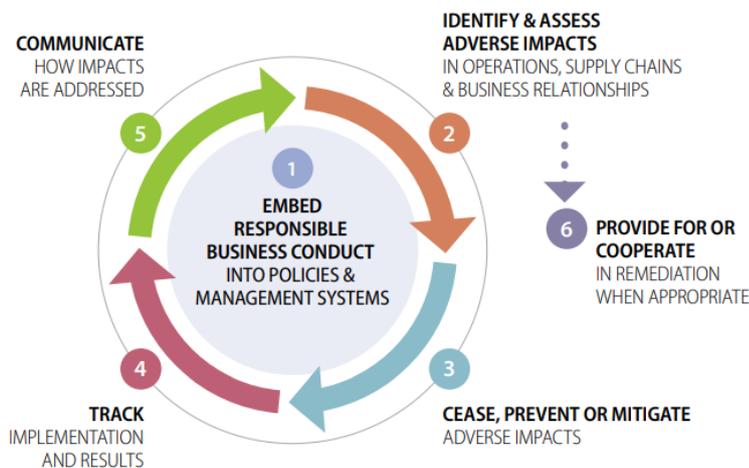


Figure 1 Due diligence process and supporting measures (OECD, 2018: 21)

² Note that the concept of 'potential adverse impacts' is conceptually similar to the concept of 'risk' that is used in the WUR methodology.

³ EU legislation does refer to the OECD Guidance (2018) as recognised international standard on Due Diligence. There is considerable alignment between legislative requirements, OECD guidance documents and other 'good practices' such as the UNGPs and different sector guidance. However, some areas of ambiguity or misalignment (between OECD Guidance and EU legislation; and between EU Legislations) show the need for additional guidance to facilitate interpretation and implementation (see: Vreman & Miralles, 2024).

⁴ This means that they have invested themselves in enhancing and promoting the guidelines and establishing National Contact points to act as a non-judicial grievance mechanism to handle cases of possible breaches with the OECD guidelines (see: https://mneguidelines.oecd.org/about/#:~:text=All%2034%20OECD%20countries%2C%20and,have%20adhered%20to%20the%20Guidelines.)).

All aforementioned legislations require companies to operationalise (part of a) OECD due diligence process (though requirements between legislation do not align fully). Step 2 of the due diligence process requires companies to identify and assess adverse impacts. The OECD recommends companies to engage in a high level screening of adverse impacts. The OECD recommends to consider: sector-, geography-, product- and enterprise-specific risk factors (see: OECD, 2018: 25 & 62-63; OECD, 2022: 9, 17 and 29-31).

Wageningen University and Research (WUR) has developed a robust methodology, the Due Diligence Risk Assessment methodology, to estimate standardised sector-specific risk scores at national and sub-national levels using secondary data. This methodology covers eight human rights risk themes and seven environmental risk themes, collectively addressing the most salient risks in the agricultural sector. The final risk score for each theme is country- and commodity sector-specific and, where possible, further disaggregated into regional risk scores (see Section 1.2. for overview of themes). There is no customised selection of risks. Instead, the methodology provides comprehensive evaluation across all 15 risk themes and aims to highlight which risks are more prominent for specific country-commodity combinations. The risk scores reflect the estimated risk prevalence and/or severity for a risk theme in a specific sector and in a specific region within a country, e.g. child labour risks in the coffee sector in Caqueta, Colombia. Each risk theme is assessed using one or more indicators, with final risk scores standardised on a scale from 0 to 5 for comparability across commodities. These scores are visualised in an interactive dashboard, allowing users to explore risks by commodity sector, national and subnational levels, and underlying indicators. Separate methodologies are provided for human rights and environmental risks.

The methodology thereby follows the OECD recommendation of considering geography, sector and product specific risks. Within the WUR methodology sector- and product specific risks are referred to as commodity-sector specific risk to account for the differences between different production systems and cultivation methods of different commodities within the agricultural sector. Given that the methodology follows a standardised approach, users can compare risk prevalence across different commodity sectors (e.g., palm oil vs. coffee), producing countries (e.g., coffee in Colombia vs. Ethiopia), and regions within a country. It provides a shared starting point for identifying enterprise-specific risk exposure and prioritising risks in the Due Diligence process. Such enterprise-specific risks should still be considered separately as this would entail the incorporation of primary enterprise-specific data into the risk assessment which falls outside the scope. Therefore, WUR is exploring developing options for standardised tools to address such enterprise-specific risks in future.

We use distinct methodological approaches for assessing human rights and environmental risks. While both human rights and environmental risks are assessed on a 0-5 scale, they follow different methodological approaches. The human rights risk assessment, developed internally by WUR, follows a five-step process outlined in Section 2.3. It relies on third-party secondary data, combining quantitative and qualitative information to evaluate risks for each human rights theme within a specific commodity and country. In contrast, the environmental risk assessment uses the LCA approach for eutrophication, acidification, climate change, and ecotoxicity. Detailed explanation on how the LCA approach was adapted for the purpose of risk assessment can be found in Section 3.1. The risks of deforestation, water stress, and biodiversity loss are assessed through spatial analysis. Explanation on the spatial analysis method is outlined in Section 3.2.

WUR Due Diligence Risk Assessment methodology has been developed over a 5-year period (since 2020) in different projects. A public private partnership (PPP) has made an important contribution to the standardisation of the methodology and scaling up of its thematic and geographical scope, aligned with developments within EU legislation. The PPP (2022-2026) has been a collaboration with the Dutch institute Topsector Agri & Food, the Port of Amsterdam, Olam Agri, Olam Food Ingredients, Syngenta, Sustainable Trade Initiative (IDH) and Acomo.

This document serves as a comprehensive protocol, providing a detailed overview of all decisions and steps taken in the development and application of this methodology. Its purpose is to transparently present the background information underpinning the risk scores featured in the WUR Due Diligence Dashboard for score users, researchers, consultants working on related topics, and other interested stakeholders. The protocol is intended to be used as both a reference for understanding the rationale behind the scores and a resource for

practitioners and experts to compare with similar methodologies or provide feedback for its improvement. The scores generated by this methodology can be accessed on the Due Diligence Dashboard website.⁵

The document is organised into two main chapters: the *Human Rights Risk Assessment* and the *Environmental Risk Assessment*. The Environmental Risk Assessment is further divided into two distinct methodologies: the *Life-Cycle Assessment* and *Spatial Analysis*. Each of the methodologies is structured into following sections:

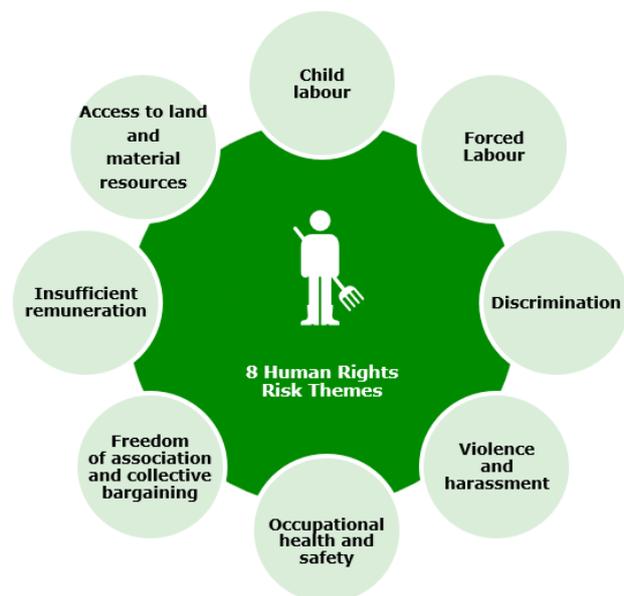
1. **High-level overview** of the approach and indicators.
2. **Detailed methodology** description.
3. **Theme-specific information**, including relevant indicators, benchmarking of these indicators, and any other theme-related details.

1.2 Overview of Human Rights and Environmental risk themes

The sustainability insights dashboard covers eight human rights risks and seven environmental risks for each country-commodity combination. The following paragraphs outline these themes and explain the rationale for their selection.

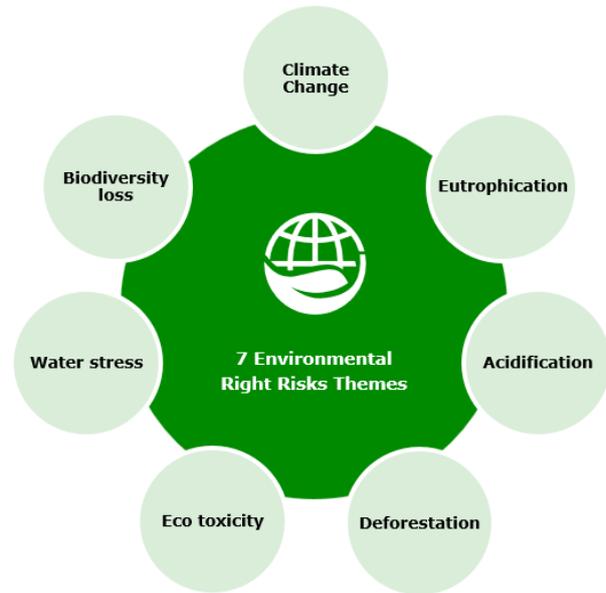
Human Rights Risks. A human rights risk refers to 'a risk of having an adverse impact on human rights'. The basis of the selection of eight human rights themes was based on an assessment of the most relevant sustainability risks in global agricultural supply chains that take place at the primary production and on-farm processing stages of the supply chain. It is in these stages that most human rights risks materialise for different stakeholders and higher percentages of vulnerable workers are present such as women, children, migrants, and minorities. International standards (such as the OECD, UN, ILO, UNGPs, SDGs) and the (evolving) EU regulatory landscape on sustainability legislation provided input for the selection of themes. An initial list of indicators was drafted based on these frameworks and further refined through expert interviews and feedback

from WUR experts and agrifood business partners. The final set of indicators was chosen to ensure relevance for assessing human rights risks at a commodity-sector level using secondary data. Some sustainability issues were considered important but required enterprise-specific or primary data and were therefore excluded. To enhance accuracy, definitions for each indicator were refined during a pilot phase, ensuring they effectively capture the most commonly observed risks. This iterative approach ensures that the selected indicators remain scientifically robust, practically relevant, and adaptable to future developments in international standards and regulations. A detailed information on indicator selection criteria can be found in Section 2.2, while theme-specific information including theme definitions are provided in Section 2.4 of this document.



⁵ <https://www.wageningenfoodviews.com/>

Environmental Risks. Environmental risks refer to the likelihood of negative impacts on the natural environment resulting from exposure to hazards. The selection of seven environmental themes was guided by an assessment of the most significant sustainability risks within global agricultural supply chains, specifically focusing on the primary production and on-farm processing stages. This process drew on international standards (such as OECD, ISO, and PEF) as well as the evolving EU regulatory framework on sustainability, including instruments like the Corporate Sustainability Reporting Directive (CSRD) and the Corporate Sustainability Due Diligence Directive (CSDDD). An initial list of indicators was developed based on these frameworks and refined through expert interviews and input from Wageningen University & Research (WUR) specialists and agrifood business partners. The final set of indicators was selected to ensure their applicability in assessing environmental rights risks at the commodity-sector level using secondary data sources.



2 Human rights risk assessment methodology

2.1 General approach: steps and scoring

The Human Rights Risk Assessment Methodology covers five standardised steps for the calculation of a final risk score for each of the eight human rights risk themes. The process is illustrated in Figure 2.

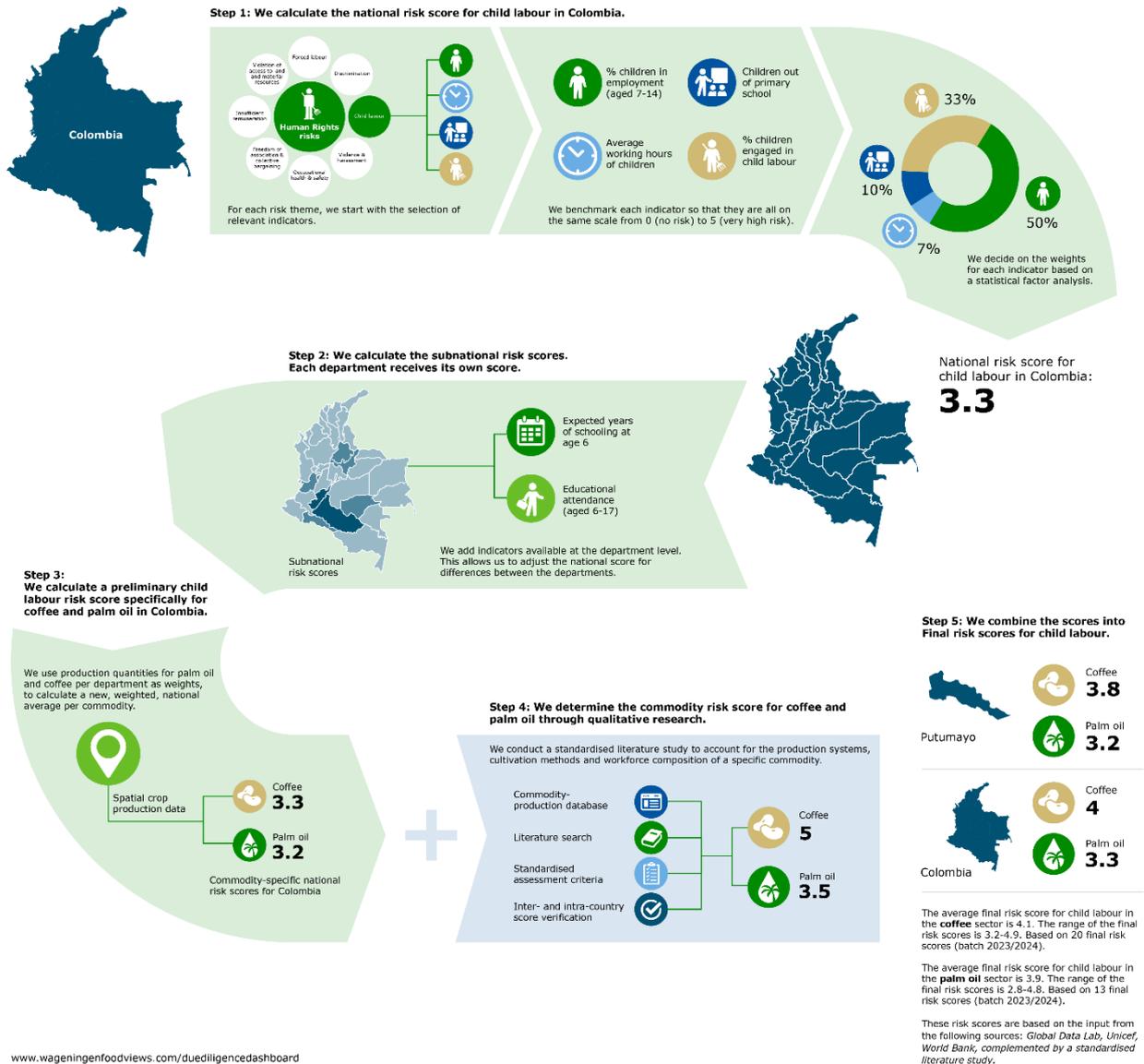


Figure 2 Human rights risk assessment methodology (Input Data Retrieved from WUR Due Diligence Dashboard 2023/24)

All steps, including data preparation or other statistical tests are performed in R. For steps 2 and 3, sub-national data availability is a prerequisite. Therefore, sub-national risk scores are only provided for themes with available sub-national data. In such cases, all steps are conducted. For themes without sub-national data, only steps 1, 4, and 5 are performed. In Section 2.3, we provide a detailed description of data selection, data preparation, and individual steps including equations and examples.

Step 1: Calculation of the national risk score

Output: National risk score (quantitative)

We calculate a weighted average of national-level indicators for each theme. The calculation is based on selected indicators relevant to the theme, the indicators are sources from publicly available third-party databases

Step 2 (only if subnational data available): Calculation of the subnational risk score

Output: Subnational risk score (quantitative)

While subnational indicators are always relevant to the theme, they are generally less direct measures than national-level data. Therefore, we use them to adjust the national scores to produce subnational scores. This adjustment is based on the difference between each subnational indicator value and the national median, which is applied to the national risk score to obtain the subnational risk score.

Step 3 (only if subnational data available): Calculation of the commodity-specific national risk score

Output: Commodity-specific national risk score (quantitative)

For the themes, where subnational data is available, we calculate commodity-specific national risk scores by combining subnational risk scores with the volume of crops harvested in a given region. Regional crop production shares serve as weights, with each subnational score weighted according to the respective region's share of crop production.

Step 4: Literature Review for commodity risk score

Output: Commodity risk score (qualitative)

We perform a standardised literature review to address data gaps and refine risk assessment with qualitative insights for the specific commodity sectors in the country of focus. This is done through standardised assessment questions tailored to each theme.

Step 5: Combining into a single final risk score

Output: Final risk score (quantitative and qualitative combined)

We merge commodity-specific national risk scores (quantitative) and commodity risk scores (qualitative) into one final score. The weight of each score is based on an expert assessment of the strength of national-level indicators and differs per risk theme. Sub-national risk scores are also combined with the commodity risk scores using the same weights. For more details, please see Section 2.3, which provides a detailed description of each step.

2.2 Overview of indicators and score per human rights theme

Since the availability of indicators and subnational indicators varies—impacting which scores can be calculated—the table below provides insight into the number of steps and data availability for each theme. Table 1 therefore provides a cross-commodity overview of the number of indicators per theme, availability of sub-national data and steps conducted in the human rights risk assessment process for each theme.

Table 1 Summary overview of applicable steps taken during risk assessment and indicators per human rights theme

Theme	Number of indicators	Step 1: national risk score	Step 2: subnational risk score	Step 3: commodity-specific national risk score	Step 4: commodity risk score	Step 5: final risk score
Child labour	National: 4	✓	✓	✓	✓	✓
	Subnational: 2					
Forced labour	National: 4	✓	✓	✓	✓	✓
	Subnational: 1					
Discrimination	National: 3	✓	✓	✓	✓	✓
	Subnational: 2					
Violence & harassment	National: 4	✓			✓	✓
	Subnational: 0					
Occupational health & safety	National: 3	✓	✓	✓	✓	✓
	Subnational: 1					
Freedom of association & collective bargaining	National: 3	✓			✓	✓
	Subnational: 0					
Access to land and material resources	National: 3	✓			✓	✓
	Subnational: 0					
Insufficient remuneration	National: 0		✓	✓		✓
	Subnational: 1					

2.3 Detailed methodology for calculating commodity-specific final risk scores per theme

In this section, we outline the methodology for assessing human rights risks, the human rights risk assessment methodology, in agricultural sectors, focusing on how we select and utilise quantitative indicator, how we collect and analyse qualitative information to arrive at a final risk score per theme. The risk assessment process is systematic and involves multiple standardised steps to ensure accuracy, coherence and reliability.

2.3.1 General guidelines on indicators, data selection criteria and weights

Identification of relevant quantitative indicators for each human rights risk theme

Prior to calculations of risks, we identified relevant quantitative indicators for each human rights risk theme based on their relevance and alignment with our data quality criteria, informed by WUR expertise and a literature review. The methodology relies on the assessment of secondary data derived from third party independent data sources. No primary data has been collected. The selection of indicators was based on WUR expertise on the different human rights risk themes, complemented by a literature review on each of the risk themes, combined with availability of third-party data and additional selection criteria related to the data sources mentioned in the following section. Based on this first assessment and recognising the multifaceted nature of human rights, we identified various indicators to estimate the different human rights risks at national and subnational level by searching for any relevant databases that could be reliable sources of data and met our selection criteria.

We identified four different types of indicators that can be used to assess a risk theme. These types of indicators are described in Table 2. Within our risk assessment methodology we aim to have at least one direct indicator and one severity indicator for each of the human rights risk themes. However, this is not always feasible due to issues of data availability or data quality. For some themes, we therefore rely on indicators that are not direct indicators. This is addressed in step 5, where we combine the results from the quantitative and qualitative assessments: when direct indicators are available, the risk score of the

quantitative assessment will receive a higher weight compared to the qualitative assessment and vice versa. For more details on this, see Table 3.

We always strive to generate subnational scores, but whether this is feasible depends on whether we are able to find subnational secondary data meeting our data requirements presented in the next section. For the themes where we could not identify subnational data, certain steps are skipped. If subnational secondary data would become available at a later stage, we would include it to make the scores for that theme available at subnational levels as well.

Table 2 Types of indicators

Indicator type	Indicator description	Examples
Direct indicators	Directly related to the risk theme	Children in employment (% of children aged 7-14) (child labour)
Severity indicators	Expressing the severity of the risk theme	Average working hours of children (child labour)
Proxy indicators	Indirect measures to proxy the extent of the risk, less related to the risk theme itself	Global Health Security Index selected indicators (occupational health & safety)
Legal framework indicators	Measures of existence of laws, policies or institutions, their quality and effectiveness. These indicators oftentimes do not measure implementation of the policies or laws and are therefore not considered direct indicators.	CPIA policies for social inclusion/equity (discrimination)

Data selection criteria

Apart from the indicator's relevance for the specific human right risk theme, we consider other selection criteria to make sure we work with reliable and up-to-date data sources that provide broad coverage in terms of countries. These criteria support our goal of a standardised risk assessment methodology with near-global coverage across agricultural sectors. The final selection of indicators (and data sources) was therefore further informed by the following selection criteria:

- **Reliability:** sourcing data from reliable databases with transparent data quality assurance systems in place
- **Transparency:** sourcing data from sources that are transparent about their data collection methods
- **Up-to-date:** data should be regularly updated; any data older than 10 years is excluded from our analysis
- **Coverage:** data should preferably cover more than 100 countries to enable a wide geographical coverage.

Benchmarking individual indicators to a 0-5 risk level scale

To make sure the indicators are comparable and can be weighted in the calculations, we assign risk levels on a 0 (no risk) to 5 (very high risk) scale.⁶ We refer to this process as indicator benchmarking. We determine benchmarks using relevant academic articles, reports, and other publications such as policy documents that provide insights into low, medium, and high values for each indicator. Key considerations include regional trends, country-specific patterns, and correlations with other risk-related indicators. For example, for the child labour indicator 'Average working hours of children,' we examined the negative correlation between working hours and child health outcomes. Additionally, we reviewed policy documents on legal limits for child labour across different age groups and regions, as well as other child labour statistics, to establish meaningful thresholds for this indicator. Apart from preventing a reliance on individual data distribution, benchmarking ensures consistency and uniform direction across all indicators (sometimes a higher value indicates higher risk, other times this is the other way around). *The benchmarks for each indicator used, together with explanations on how benchmarking was done per indicator, can be found in the individual sections describing each human rights theme present in Section 2.4.*

⁶ In previous versions of the methodology we used quintiles to create a score between 0 and 5 for each of the indicators. The drawback of this was that it makes the scores relative to the countries available for the indicator. For example, if an indicator does not include any high-income countries at all, some risks might be underestimated. Additionally, if these countries were to be added in a later stage, the entire analysis would have to be redone. We therefore benchmark the indicator values into risk scores between 0 and 5.

Determining weights for each national-level indicator per human rights risk theme

In order to execute the first step in calculating the human rights risk score (calculating the national risk score), the selected national indicators need to be weighted. These weights are determined by following these steps:



Since different indicators capture thematic risks to varying extents, we study the relationships between indicators and their relevance to the specific theme to assign weight to each individual indicator. For instance, a direct indicator generally has a stronger association with the theme in question than a legal framework indicator, therefore their weights in the risk calculation should differ. To assign weights to each individual indicator, we use factor analysis—a statistical method that identifies relationships between variables to uncover underlying factors. This technique condenses numerous variables into key factors by extracting common variance, resulting in a unified score. We verify the outcomes of the factor analysis to make sure that the weights are in line with which indicators are direct indicators to make sure that the factor analysis captures the right concept.

In factor analysis, the more datapoints there are per variable, the more accurate the results are. Therefore, one of the prerequisites was to ensure a large enough geographical coverage in order to ensure the weights to be as accurate as possible. Since factor analysis requires complete data for all indicators included in the analysis, we address missing values (in this case absent data for specific countries) through predictive mean matching (PMM), a statistical imputation method. After creating a dataset with both observed and imputed values, we benchmark the indicators as previously described. To accurately assess how each indicator relates to a specific human rights theme, we utilise benchmarked data rather than raw data in our factor analysis. This ensures that the analysis reflects the indicators' relevance to the human rights theme, rather than interrelations between the indicators themselves. It is important to note that imputed values are solely used for the factor analysis and not in calculating actual risk scores, ensuring that final risk assessments are based only on observed data. After determining the weights, the imputed values are discarded, and only the derived weights are applied in calculating the national risk scores. *Any theme-specific decisions made in this step, as well as the final weights per indicator, are described in Section 2.4, Theme-specific information.*

2.3.2 Steps in calculating the human rights risk scores

Step 1: calculation of the national risk score

We start by calculating a national risk score. For each of the human rights risk themes between 3 or 4 thematic indicators were selected and benchmarked based on the process described above. The national risk score is a weighted average of the different indicators that were selected for each of the human right risk themes.

Example of risk of child labour in Colombia in the coffee sector



We use four indicators for the risk of child labour. Two direct indicators - % of children in employment (aged 7-14) and % of children engaged in child labour; and 2 severity indicators – average working hours of children and children out of primary school. For Colombia, these indicators have the following values and corresponding benchmarks and weights:

Indicator	Indicator type	Indicator value	Benchmarked risk level	Indicator weight
% of children in employment (aged 7-14)	Direct	13.36%	4	50%
% of children engaged in child labour	Direct	7%	3	33%
Average working hours of children	Severity	14.1	3	10%
Children out of primary school	Severity	1.21%	1	7%

The generic equation for calculation of the national risk score is the following:

$$Ind1 * Weight1 + Ind2 * Weight2 + Ind3 * Weight3 + \dots \cong national\ risk\ score$$

Example of risk of child labour in Colombia in the coffee sector: national risk score of child labour in Colombia

In the case of Colombia, the national calculation is as follows:

$$4 * 0.5 + 3 * 0.33 + 3 * 0.1 + 1 * 0.07 \cong 3.3$$

The calculation is based on the below benchmarked risk levels and weights per indicator:

Indicator	Benchmarked risk level	Indicator Weight
% of children in employment (aged 7-14)	4	50%
% of children engaged in child labour	3	33%
Children out of primary school	3	10%
Average working hours of children	1	7%

Most of the countries lack data for at least one of the indicators per theme. To address this issue, we also compute national risk scores for countries with some missing indicators, provided they meet one key criterion. This criterion requires that the combined weight of the available indicators per theme must be at least 60%. This threshold ensures that the national score remains reliable, as it guarantees that a minimum of 60% of the final score is based on actual (non-imputed) data. As an example, when looking at the indicator weights for the theme of child labour, having data for '% of children in employment (aged 7-14)'

and 'children out of primary school' would suffice to produce a national score as their combined weight is 60%.

In the case the assessment of the national risk score relies on a selection of indicators with a combined weight of 60% or higher, the original weights are rescaled to ensure that their relative weights that were determined through the factor analysis stay the same.

$$New\ weight = \frac{Original\ weight\ indicator\ 1}{Original\ weight\ indicator\ 1 + original\ weight\ indicator\ 2}$$

To illustrate the process, let's assume for a country, datapoints for only two indicators are available for the risk of child labour. These available indicators are '% of children in employment (aged 7-14)' and 'children out of primary school'. In this example, we would still proceed with the calculations for a national risk score since the cumulative weight of these two indicators is 60%. We would rescale their individual weights in the final calculation as follows:

Indicator	Original indicator weight	Rescaled indicator weight
% of children in employment (aged 7-14)	50%	0.5/0.6 = 83%
Children out of primary school	10%	0.1/0.6 = 17%

Step 2: calculation of the subnational risk score

Step 2 and 3 are only conducted only if subnational indicators are available for that specific human right risk theme. Subnational data is available for 5 out of 8 themes, see Table 1. For the three themes where no subnational data is available (themes 'Violence & harassment,' 'Freedom of association and collective bargaining,' 'Access to land and material resources'), step 2 and 3 are skipped, step 1 moves directly to step 4. For the themes, for which sub-national data is available as indicated previously,⁷ the national risk score is adjusted for differences in subnational indicators. In this step we use sub-national data pertinent to the individual human right risk themes that allows us to estimate these risks at a more granular level. Since the subnational data come from different databases, we harmonise the data so that it always reflects the highest level of subnational administrative divisions (ADM1, e.g. states in the US). To calculate the subnational risk score per human right risk theme, we start by importing the data for the sub-national indicators. Then we calculate the median value of each individual subnational indicator per country. Hereafter, we calculate the fraction of the national median for each indicator for each subnational division. This gives an indication on how a specific subnational administrative division unit performs on the selected indicator compared to the national average.

To calculate the fraction of the median, we use the following equation:

$$\frac{Indicator\ value\ per\ subnational\ unit}{National\ median} = Fraction\ of\ the\ median\ per\ subnational\ unit$$

Finally, to create the subnational risk scores for each theme, we adjust the national risk scores by using correction categories that are based on the fractions of the median mentioned in the previous paragraph. We use adjustments of the national score instead of calculating separate subnational risk scores using subnational data only, as subnational data is much harder to find at global scales, and as these indicators are therefore less directly related to the concept we are trying to capture. We divide the fractions of the median into 7 different correction categories (no correction, small score increase, small score decrease, medium score increase, medium score decrease, large score increase and large score decrease), which will then be used to correct the national score for subnational differences by increasing or decreasing the risk score by the value of corresponding correction category. The value of the correction categories (e.g., +0.5) differs for

⁷ Please see Table 2 for overview of indicators per theme and previous section for specification of themes with and without sub-national data.

each theme and depends on the validity of the sub-national indicators. Sub-indicators that are more related to the concept we are trying to capture in the theme receive higher correction categories. For themes where we have relatively strong proxy indicators, the maximum correction category is set to +1 or -1 point change in the risk score, as we assume that the national situation in most cases still reflects risk quite well, and that higher correction categories would undermine the national score. For themes with less strong subnational indicators, the subnational adjustment categories are lower. For determining the correction categories we try to follow a normal distribution. *The exact cut-off points for the correction categories as well as the correction categories themselves can be found in the theme-specific sections in Section 2.4.*

The sub-national risk score is expressed as:

$$\text{National risk score} + \text{Correction category per subnational unit} = \text{Subnational risk score}$$

Example of risk of child labour in Colombia in the coffee sector: subnational risk scores of child labour in Boyaca and Caqueta regions of Colombia

For the theme of child labour there are two sub-national indicators. During this step, we calculate subnational scores for all regions in Colombia, for which this data is available. In this specific case, there are 25 regions, for which we have data and therefore subnational risk scores.

The table below provides examples from three regions to illustrate the calculation. Because child labour has two sub-national indicators, we first take the mean of the fraction of the median for the two indicators. In the example in the table below, the fraction of the median for Boyaca department is 1.10 for 'expected years of schooling' and 1.03 for the mean of the 'educational attendance' variables. The mean of these two is 1.07. The correction categories are based on this mean.



Indicator	Indicator value	Correction category	Subnational risk score
Boyaca department	Expected years of schooling at age 6	15	-0.33
	Mean of the educational attendance variables for all age classes between 6 and 17	96.2%	2.97
Caqueta department	Expected years of schooling at age 6	13	0.33
	Mean of the educational attendance variables for all age classes between 6 and 17	92.4%	3.63

Step 3: calculation of the commodity-specific national risk score

This step builds on the subnational scores calculated in step 2. Therefore this step is skipped for themes for which subnational data is not available. In this step we calculate a commodity-specific national risk score, which basically means that we combine the subnational risk scores of step two with harvesting data. The latter shows the regional variation in crop production for the specific commodity at study. This allows us to calculate a commodity-specific national score that combines the data of step 1-3 into one new score that is both commodity and country -specific. In order to calculate the commodity-specific national risk scores, we start by importing crop production data from MAPSPAM (2020)⁸ into R, which includes global maps for 42 different crops. We use data on 'harvested areas', which is the area in hectares dedicated to the production of a specific crop, but also accounts for multiple harvests of a crop on the same plot. We use the harvested areas instead of actual areas as harvests are often labour-intensive, and each harvest therefore increases the risk of human rights issues. The MAPSPAM data is presented at the pixel-level, where each pixel represents an area of 10x10 kilometres. The harvested area is aggregated to the same sub-national disaggregation level as used in step 2 (ADM1, e.g. states in the US). The shares of the production for each subnational unit within a country are then used as weights for the calculation of the commodity-specific

⁸ <https://mapspam.info/>

national risk score. For example, if 10% of Colombia’s coffee production would be coming from its state Parana, the subnational risk score of Parana would be multiplied by 0.10. The sum of all coffee-producing regions in Colombia would then be taken to get the commodity-specific national risk score.

The equation for calculating commodity-specific national risk score is:

$$\text{Subnational Unit}_1 * \text{Share of commodity production in Subnational Unit 1} + \text{Subnational Unit 2} * \text{Share of commodity production in Subnational Unit 2} + \dots + \text{Subnational Unit}_n * \text{Share of commodity production in Subnational Unit}_n = \text{Commodity specific national risk score}$$

Example of risk of child labour in Colombia in the coffee sector: commodity-specific national risk score of child labour in coffee sector in Colombia

For each of the 25 subnational units, we have calculated the share of total coffee production taking place in a given subnational unit. This share is plugged in as a weight to calculate a weighted average of subnational score to estimate the risk of child labour specific to coffee sector in Colombia. The share of coffee production in Boyaca region is 1%, in the Caqueta region is 0.4%.

These weights are calculated for all 25 subnational units and then combined into one commodity-specific national risk score for child labour.

The equation for the weighted average to arrive at a commodity-specific national risk score is:

$$2.97 * 0.01 + 3.63 * 0.004 + \dots + \text{subnational risk score}_{\text{region 25}} * \text{share of coffee production}_{\text{region 25}} \cong 3.3$$



Subnational units	Subnational risk score	Share of coffee production per subnational unit
Boyaca department	2.97	0.01
Caqueta department	3.63	0.004

Step 4: Standardised literature review to provide a commodity risk score

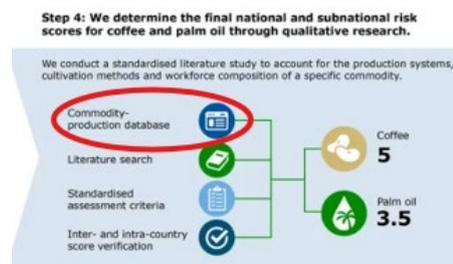
In order to increase validity of the risk assessment we calculate a ‘commodity risk score’ based on the assessment of qualitative data, this assessment allows us to zoom in at the specific circumstances of production in the country-commodity combinations under study. This step complements the assessment of quantitative indicators in step 1-3. In order to calculate a ‘commodity risk score’, researchers engage in a standardised literature review that zooms in at all 8 human right risk themes. In this step we gather information to fill data gaps from previous steps, supplement national-level data with qualitative insights, and provide commodity-, workforce- and theme-specific information that is relevant to the country of production. The agricultural sector and the specific circumstance of production of a specific commodity bring with them specific risks and specific risk levels. The literature review is standardised along thematic questions and clear assessment criteria -operationalised in a benchmarking table- for the identification of commodity-specific risks. The standardisation allows researchers to assess these risks consistency and ensure high reliability and validity of commodity risk scores. Each literature review walks through the same actions, thematic questions and predefines assessment criteria. Researchers are permitted to use relevant information that is found in the assessment of a specific theme in the assessment of another human rights risk theme, allowing the development of a full picture of the local circumstances of production. The assessment of qualitative data is guided by specific criteria regarding data quality, publication dates and highlights the importance of sector- and workforce characteristics. This section will lay out the standardised set of actions that make up the literature review. The thematic questions for each human rights risk theme can be found in Section 2.4.

Step 4.1 Developing a database of commodity production systems

We start the literature review by exploring the general characteristics of a commodity sector within a specific country. This includes aspects such as production systems (e.g. large and/or small-scale production,

cultivation methods, and workforce composition. The understanding the commodity- and country-specific features of production is crucial, as these factors can greatly influence risk profiles. This information is documented in a *commodity-production database*. This database contains information on a wide range of commodities, where generic information on the production of the commodity, and supplemented with country-specific information on its production systems, cultivation methods, and workforce. This commodity and country knowledge forms the basis for the standardised assessment of individual human rights risks.

Example* of risk of child labour in Colombia in the coffee sector: information on coffee production in Colombia compiled in the commodity production database



Introduction The coffee sector is extremely important for the Colombian economy. It represents 22% of the country’s agricultural GDP and the main source of income for more than 550,000 families. It is also the most exported product. At the level of the occupied area, coffee cultivation occupies a very important place with 22 of the 32 departments of the country producing coffee.

Top producing regions The main coffee producing departments are Huila, Antioquia, Tolima, Caldas, Valle del Cauca, Cauca, Risaralda, Santander, Cundinamarca, Nariño, Quindío, Norte de Santander, Cesar, La Guajira, Magdalena, Boyacá, Meta, Casanare and Caquetá.

Production system In Colombia, the average coffee farm size is 4.5 hectares, with small farmers (under 5 hectares) producing around 69% of the country’s coffee. Studies show that 96% of producers are small-scale, averaging 1.3 hectares each. The small farm sizes help maintain high coffee quality and consistency, but the lack of mechanisation makes production labor-intensive and less efficient compared to other countries.

Workforce Coffee farming in Colombia is mainly family based, using the labour of both men and women. The labour market associated with coffee production is characterised by the combination of family labour and wage employment. These coffee-producing households have a differential incidence of monetary poverty in the rural economy, which affected 47.5% of the population living in populated centres and scattered rural areas in 2019.

Additional information Based on the types of labour remuneration and specialisation, it is possible to identify at least Colombian coffee pickers can be categorised into at least four types based on labor remuneration and specialisation. According to the FNC, only 1.5% of pickers have formal employment contracts, while the majority work under informal agreements such as piece-rate, daily-wage verbal contracts, or as unpaid family workers. Piece-rate contracts are the most common, used by 47% of small farms, 60% of medium farms, and 74% of large farms, followed by daily wage contracts. Informal labour arrangements are widespread on farms not formally registered as companies but affiliated with the FNC.

References: https://www.ilo.org/wcmsp5/groups/public/---americas/---ro-lima/---sro-lima/documents/publication/wcms_866190.pdf; <http://www.coffeebehindthescenes.com/en/country/colombia>; <https://www.minagricultura.gov.co/noticias/Paginas/CafeProductoInsigniaColombiaMundo.aspx>; <https://pulitzercenter.org/stories/colombias-coffee-plantations-struggle-aging-workforce>; <https://www.somo.nl/wp-content/uploads/2018/10/case-study-Working-conditions-of-flower-packers-and-coffee-pickers-in-Colombia.pdf>

*Please note that this is only a selection of the information we have recorded, provided to illustrate our work.

In many producing countries, multiple production systems coexist, such as large-scale plantations and smallholder farming, that all cater (to varying degrees) to the export market. These production systems can have different risk levels for different human right risk themes. In these cases the commodity risk score is based on an assessment of the risk for both production systems in the production country, giving a higher weight to the more ‘severe’ risk. This reflects a preventive approach to risk. We deliberately do not choose to

focus on one of the systems based on criteria such as volume or workforce as the commodity risk score needs to be a valid point of reference to different users that will have different suppliers.⁹

Step 4.2 Literature search based on standardised set of questions for each theme

This theme-specific assessment builds on the insights gathered in the commodity-production database. In addition to production-related characteristics that may impact one or more human rights risk themes, it is essential to gather any other relevant information specific to the human rights risk theme itself. Therefore, once the specific features of the commodity sectors in a given country have been compiled, we conduct a targeted search for theme-specific information. We search for information based on a standardised set of thematic questions, which establish whether there is sufficient and reliable qualitative information for the thematic risk at the level of production of the specific commodity. Ground rules on what constitutes sufficient and reliable information are indicated in Appendix 2. Researchers look for direct information on a specific human rights risk. For instance, is there reliable and sufficient qualitative information discussing the occurrence of child labour in production of coffee in Colombia? If this is not the case: either the information is not there or not meeting our quality criteria, we search for indirect information on the risk that supplements that the information in the *commodity production database*. As the absence of direct information on the specific risk can hint towards the absence of risk but can also be caused by the absence of qualitative data on the risk in this particular context. By looking for indirect information we can further substantiate the thematic risk level based on risk increasing and decreasing factors. For instance: is there child labour present in commodity sectors that have similar production characteristics? Are workers and/or farmers cultivating both multiple crops, one of which has evidence of child labour? If there is no direct or indirect qualitative information available, no meaningful commodity risk score can be established and the researchers do not proceed to the second level of analysis. More information on data availability during the assessment of the commodity risk score is indicated Appendix 3.

⁹ As indicated before: the risk assessment methodology is based on secondary information. It follows the OECD's recommendation to consider geography, sector and product specific risks. This methodology is not able to assess enterprise-specific risks as that would require the collection of primary data that is user specific. Only the latter can inform a meaningful focus on specific production systems as a way to further specify risk levels (see also OECD, 2018; 2022).

Example* of risk of child labour in Colombia in the coffee sector: literature search based on standardised set of questions for the risk of child labour in coffee production in Colombia

The information in the assessment table below was following the standardised set of questions for the literature search on the risk of child labour (see Section 2.4.1).



Theme	Guiding questions	Summary information
Child labour	Q1. Is there direct evidence linking commodity, country and theme?	Yes, several high and good quality sources indicate child labour is still occurring in the Colombian coffee sector. Prevalence is lower with Ministry of Labour and the National Federation of Coffee Growers of Colombia implementing interventions with a goal of child labour reduction.
	Q2. Is the commodity or sector in USDOL list of goods/USDOL Report?	Yes
	Q3. Is the sector a risk sector according to USDOL 'findings on the Worst forms of Child Labour' in country?	Yes, production of coffee is mentioned. Agriculture is the dominant sector for child labour (76.9%); 2021 USDOL project on Child Labour in Colombian coffee concluded that significant steps were made to combat child labour, however, more than 390,000 children are engaged in CL throughout the country, most working in agriculture. The coffee sector is particularly susceptible to CL, as the crop is largely grown on small-scale family farms.
	Q4.a. Is there literature identifying 'child labour opportunities' in production of commodity?	Yes, children and adolescents were found to participate in activities such as fertilisation coming in contact with fertilisers or fumigation products, but also other activities such as planting, pruning and soil preparation operating machinery and working with other production tools
	Q4.b. Does the country's production system and cultivation methods enable involvement of children in prod of commodity?	Yes, the coffee sector is particularly susceptible to CL, as the crop is largely grown on small-scale family farms with reliance on family labour. Low level of mechanisation requires more labour.
References: https://www.dol.gov/sites/dolgov/files/ILAB/child_labor_reports/tda2022/Colombia.pdf ; https://www.dol.gov/sites/dolgov/files/ILAB/evaluation_type/final_evaluation/Colombia_Avanza_feval.pdf ; https://www.dol.gov/sites/dolgov/files/Gayar.Arwa.T%40dol.gov/ANNEXG~4.PDF ; https://www.ilo.org/wcmsp5/groups/public/---americas/---ro-lima/---sro-lima/documents/publication/wcms_866190.pdf ; https://www.somo.nl/wp-content/uploads/2018/10/case-study-Working-conditions-of-flower-packers-and-coffee-pickers-in-Colombia.pdf ; https://www.ilo.org/lima/sala-de-prensa/WCMS_801431/lang--es/index.htm		
*Please note that this is only a selection of the information we have recorded, provided to illustrate the literature search.		

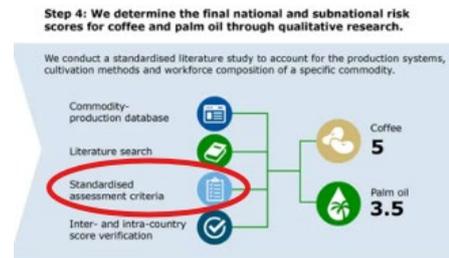
We use an Excel file to record and analyse data for each of the thematic risks associated with a particular country-commodity combination. The datafile allows the researcher to enter the important quotes used from the literature source, literature reference and a reliability indicator (high-low). The researcher will record the thematic summaries for each of the human right risk themes before assigning the theme a commodity-specific risk level (see Section 2.4). Thematic summaries are 'standalone conclusions' that could be used externally and allow another researcher to come up with the same risk level.

Step 4.3 Assigning a commodity risk score per theme based on standardised assessment criteria

We establish the thematic risk level by aligning the thematic summaries (see Section 2.4) with standardised assessment criteria that have been established for each of the human rights risks. For each of the human right risk themes a benchmarking table has been developed that guides the assessment of thematic risks on a 0 to 5 scale. This table helps the researcher to interpret and assess qualitative data for each of the human right risk themes. The risk levels characteristics were identified based on expert input, literature research

and an extensive pilot and refinement phase (2023-2025) using the first batches of risk score calculations to further refine the descriptions to account for different situations and ensure consistent application.

Example* of risk of child labour in Colombia in the coffee sector: a commodity risk score for the risk of child labour in coffee production in Colombia based on standardised assessment criteria



Thematic summary for the risk of child labour in Coffee, Colombia	Standardised assessment criteria for child labour	Commodity risk score assigned
<p>There is direct and reliable evidence for the occurrence of child labour in the coffee sector in Colombia. The dominance of smallholder farming systems (including small farm sizes, low incomes and climate volatility) makes the sector susceptible to child labour. Evidence suggests that children can be involved in hazardous activities such as fertiliser and pesticide application (but does not need to be that way). Not all work children do has to be labelled as child labour. Focus country made progress in combatting child labour.</p>	<p>Very high risk level: There is sufficient direct evidence that children are involved in the production of the specific commodity in the focus country, tasks involve hazardous activities. Child labour is widespread in the production of the commodity. Child labour is likely to interfere with schooling. Scores on other human right risk themes indicate high vulnerability of children. Focus country knows weak law enforcement.</p>	<p>5</p>

*Information in this table is for illustrative purposes only. To see standardised assessment criteria for all risk levels for the theme of child labour, please see Section 3.3.1.

Step 4.4 Inter- and intra- country cross-check of the commodity risk scores

To avoid researcher bias and ensure comparability between sectors and countries all commodity risk scores (for each of the human right risk themes) are cross-checked by an experienced researcher and another cross-check with the broader team of researchers that ensures inter- and intra-country validity of risk scores. This process also helps address scores in areas with scarce information or evidence gaps to enhance the robustness and reliability of the final risk scores. The first step in this process is the reviewer, that looks at the thematic summaries (in step 4.2) and verifies whether the assigned risk score correctly matches with the assessment criteria (step 4.3). If the two researchers reach different conclusions, the assessment of the specific risk theme is repeated, or a third researcher is involved. Additionally, a broader cross-check round is built in the process before finalising the commodity risk score. This round consists of multiple sessions with a team of 2 to 4 experienced researchers in which we compare commodity risk scores for different sectors within specific countries and for specific sectors between different countries to check for possible outliers that cannot be explained by the thematic conclusions. These sessions are held to ensure consistency of scoring across countries and sectors. If needed risk scores are adapted based on this round (and possibly additional data). For instance, we compare the risk scores of different producing countries (inter-country) to ensure commodity level characteristics are equally reflected in the assessment of risk. As data availability might impact the thematic conclusions and therefore risk level, but by comparing different producing countries the assessment we might be able to complement thematic conclusions with relevant commodity-specific data from other producing countries (e.g. occupational hazards such as pesticide use). The same type of cross-check is done for multiple commodities within one country (intra-country). Furthermore, certain qualitative data might be available for specific commodity sectors but contain relevant information for other sectors as well (e.g. on land rights issues or labour shortages). If assessment inconsistencies are to be found and cannot be explained by the thematic conclusions and specific sector characteristics, these inconsistencies will be addressed in this step.

Step 5: Calculation of the final risk score

In the final step of our risk assessment we combine the (commodity-specific) national risk score and the commodity risk score into a final risk score for each theme. This final risk score represents the most reliable and valid assessment of risk for the specific human rights risks in the designated commodity sector and focus country. WUR interpretation of the final risk score can be found in Appendix 7. Influenced by the availability of subnational data (as discussed before), the final risk score can be based by either combining the score of step 1 (national risk score) with step 4 (commodity risk score), or combining the risk score of step 3 (commodity-specific national risks score) with step 4 score (commodity risk score). See Table 1 for an overview. The weighing between the two risk scores differs per human right risk theme and is determined by several factors:

- **Availability of data:** Whether a commodity-specific national risk score is available or only a national risk score.
- **Type of quantitative indicators:** The extent to which direct indicators are available for a given theme, or whether the assessment relies solely on proxy indicators.
- **Theme-specific complexity:** Certain themes are inherently more difficult to quantify using indicators than others.

Each of these factors and a combination of them affect the decisions on weighing. For instance, if for a theme there is a commodity-specific risk score and availability of direct indicators, we assign a higher weight to the national risk score. If, however, we deal with a theme that is more challenging to capture with data, such as access to land and material resources that includes many different aspects – expansion of plantations affecting neighbouring communities, natural resource pollution due to commodity production affecting communities living in vicinity of production sites, presence of violent conflicts affecting wider communities including

The generic equation for the final risk score calculation per theme is:

$$(Commodity\ specific)\ national\ risk\ score_{theme1} * Weight\ (commodity\ specific)\ national\ risk\ score_{theme1} + Commodity\ risk\ score_{theme1} * Weight\ commodity\ risk\ score_{theme1} = Final\ risk\ score_{theme1}$$

Table 3 gives a comprehensive overview of the weights assigned to (commodity-specific) national risk score and the commodity risk score for each human rights risk theme as well as an explanation behind this weight distribution. More detail information on the specific human rights risk can be found in Section 2.4.

Table 3 Weighing the different human rights risks methodologies

Theme	Commodity-specific national risk score available	Weight (commodity-specific) national risk score	Weight commodity risk score	Argumentation
Child labour	Yes	60%	40%	Higher weight given to the national risk score due to: <ul style="list-style-type: none"> • Availability of two direct indicators measuring child labour prevalence • Severity indicators capture some of the drivers of child labour • Subnational data available, therefore, national risk score is commodity-specific • Commodity risk score is complementary to the commodity-specific national risk score as it captures production characteristics such as presence of smallholder farming, reliance on family labour and other risk increasing factors
Forced labour	Yes	60%	40%	Higher weight given to the national risk score due to: <ul style="list-style-type: none"> • Availability of a direct indicator measuring forced labour prevalence • Severity indicators capture some of the drivers of forced labour & presence of policies and enforcement measures governments implement to prevent and mitigate modern slavery cases • Subnational data available, therefore, national risk score is commodity-specific • Commodity risk score is complementary to the commodity-specific national risk score as it captures production characteristics such as large versus small-scale farming, presence of marginalised groups in production processes and other risk increasing factors

Theme	Commodity-specific national risk score available	Weight (commodity-specific national risk score)	Weight commodity risk score	Argumentation
Discrimination	Yes	40%	60%	Higher weight given to the commodity risk score due to: <ul style="list-style-type: none"> No direct measure of prevalence of discrimination at workplace National thematic indicators are exclusively legislative framework indicators But subnational data available, therefore, national risk score is commodity-specific Commodity risk score can better estimate the prevalence and severity of discrimination in the commodity sector Commodity risk score also accounts for workforce composition (presence of vulnerable groups), which can substantially influence the risk of discrimination
Violence and harassment	No	50%	50%	Equal weight given to the national and commodity risk scores: <ul style="list-style-type: none"> Availability of a direct indicator of violence and harassment at workplace; however, this direct indicators has its limitations (perception-based, limited sample per country) Legal framework and proxy indicators available No subnational data available, therefore national score is not commodity-specific Commodity risk score assesses prevalence and severity aspects related to the commodity sector in question Commodity risk score also accounts for workforce composition (presence of vulnerable groups), which can substantially influence the risk of violence and harassment
Freedom of association and collective bargaining	No	40%	60%	Higher weight given to the commodity risk score due to: <ul style="list-style-type: none"> Availability of two direct indicators measuring collective bargaining coverage and trade unions density Two legal framework indicators measuring level of compliance with labour rights However, many of the countries, in which assessment is being conducted, producers are not organised therefore trade unions and collective bargaining rates are not applicable to their sectors. Hence, the two direct indicators are not capturing all aspects of the theme. In some sectors, presence of cooperatives or farmer organisations play an essential role for this theme. Freedom of association is not captured in the data and is accounted for in the commodity risk score. Freedom of association influences collective bargaining in various ways such as ability to form and join unions.
Occupational health and safety	Yes	30%	70%	Higher weight given to the commodity risk score due to: <ul style="list-style-type: none"> Only proxy indicators available for the national risk score calculation Subnational data available, therefore, national risk score is commodity-specific Occupational health and safety is often defined by the sector itself. Agricultural sector in general is a high risk sector due to the physical demands, heightened exposure to toxic chemicals among others. The commodity risk score directly captures these sector specific aspects as well as the presence and enforcement of preventative or remediation measures.
Access to land and material resources	No	30%	70%	Higher weight given to the commodity risk score due to: <ul style="list-style-type: none"> Only legal framework indicators available for the national risk score calculation and these are focusing on indigenous peoples' and communities, while the theme is broader No subnational data available, therefore national score is not commodity-specific Access to land and resources affects not only indigenous peoples but also communities near commodity production localities. Broader issues, such as land tenure arrangements, (land) conflicts in production areas, can directly impact the producers themselves. While existence of legal protections, captures in the quantitative indicators can indicate a risk level, these indicators do not show whether actual compliance takes place. The commodity risk assessment on the other hand addresses all these drivers.
Insufficient remuneration	Yes	100%	NA	The risk of insufficient remuneration is assessed using the living income deficit indicator, which evaluates both the prevalence and severity of wage or income earners not achieving a living wage or income. As a direct measure of insufficient remuneration, it eliminates the need for qualitative assessment, as it inherently reflects the living wage or income gap.

Example of risk of child labour in Colombia in the coffee sector: Final child labour risk score for coffee in Colombia

The final risk score calculation for child labour in the Colombian coffee sector is:

$$3.3 * 0.6 + 5 * 0.4 \cong 4$$



2.4 Theme-specific information

This section provides detailed insights into eight key human rights themes, each of which is addressed in a dedicated sub-section. Each human rights risk theme is introduced by providing a definition followed by an overview of the national and subnational indicators, benchmarks and indicator weights used for the calculation of (commodity-specific) national risk scores. Hereafter, we provide an overview of the standardised questions and the assessment criteria (benchmarking table) that form the basis of for calculating the commodity risk score

2.4.1 Child labour



Definition The definition used for child labour is taken from the ILO. 'Child labour refers to work that: is mentally, physically, socially or morally dangerous and harmful to children, and/or interferes with their schooling by depriving them of the opportunity to attend school, obliging them to leave school prematurely, or requiring them to attempt to combine school attendance with excessively long and heavy work' (ILO, n.d.).^{xi} Whether or not particular forms of work can be called child labour depends on the child's age, the type and hours of work performed.

National indicators for calculating the national risk score in step 1 of the human rights risk assessment methodology

We identified four national indicators to capture the risk of child labour, these are two direct indicators: 'percentage of children aged 5-17 years engaged in child labour'¹⁰ and 'children in employment (% of children aged 7-14)';¹¹ and two severity indicators: 'children out of school, primary education',¹² and 'average working hours of children, ages 7-14 (hours per week)'.¹³ These were selected based on their ability to directly capture the issue of children being involved in economic activity and severity of the risk.

'Children in employment (% of children aged 7-14)' is an indicator showing the percentage of children in a given country involved in economic activity for at least one hour in the reference week of the survey. This indicator captures children between ages of 7-14. The data source is a database with a collection of information from household surveys collected by International Labour Organization, UNICEF, World Bank and national statistic agencies. The database does not include datapoints from countries considered high income economies.

¹⁰ <https://data.unicef.org/resources/dataset/percentage-children-aged-5-14-years-engaged-child-labour-sex-place-residence-household-wealth-quintile/>

¹¹ <https://data.worldbank.org/indicator/SL.TLF.0714.ZS>

¹² <https://data.worldbank.org/indicator/SE.PRM.UNER>

¹³ <https://data.worldbank.org/indicator/SL.TLF.0714.WK.TM>

'Percentage of children aged 5-17 years engaged in child labour' is also measuring the share of children engaged in an economic activity. This indicator disintegrates the prevalence based on age group. For the age group 5-11, it accounts for children who worked at least one hour a week; children aged 12-14 years, it accounts for 14 or more hours; and 43 hours or more for children aged 15-17 years of age.

It is important to note that child labour prevalence, whether children in employment or children engaged in child labour, is not being collected in the high income economies. Therefore, countries such as the Netherlands, Italy, United Kingdom, or France, Australia or New Zealand do not have datapoints included. Not to exclude these countries from having a risk score, due to missing data, we made an assumption that the child labour prevalence in these cases is zero. This is of course a big assumption that likely does not represent a reality. Nevertheless, we always combine the national score with a commodity risk score to adjust for the potential inaccuracy in this assumption.

Similar to the 'children in employment (% of children aged 7-14)' indicator, the 'average working hours of children, ages 7-14 (hours per week)' is an aggregate of data collected through household surveys administered by ILO, UNICEF, WB and national statistic agencies as part of the 'Understanding Children's Work' project.¹⁴ The indicator captures the average number of hours that children aged 7-14 are working (engaged in economic activity) and not attending school per week. The indicator does not capture household work and is restricted to employment only.

'Children out of school, primary education' looks at the number of children of primary school age that are not enrolled in primary or secondary education. The data is collected by the UNESCO Institute for Statistics through its annual education survey that is distributed globally.

Benchmarking of national indicators used for calculation of national risk score in step 1 of the human rights risk assessment methodology

To benchmark the direct indicators, we looked at reports and studies discussing trends in child labour prevalence based on income levels and regional differences, particularly in the agricultural sector.¹⁵ By examining regions identified in the literature as highly prone to child labour in agriculture, we assessed how these trends translated into child labour prevalence numbers to inform our benchmark values. Similarly, we considered regions known for low child labour prevalence to establish lower benchmark thresholds. A similar assessment was done for severity indicators. In the case of 'average working hours of children', we have performed a quick analysis of national legislations in countries with different profiles to compare legal maximums of hours worked per age group, as well as studies showing impact on children's health with increased number of hours that children work to interpret the data points in a meaningful way to establish appropriate risk levels. For 'children out of school, primary education' we conducted a similar exercise to the benchmarking of direct indicators. We reviewed reports analysing regional differences, including Europe, Northern America, Central Asia, and other regions covered in these studies.¹⁶ To validate our findings, we cross-checked data with case studies of countries known for low child labour prevalence and corresponding out-of-school rates. Similarly, we verified these numbers for countries with high child labour prevalence, particularly in the agricultural sector.

¹⁴ <https://www.unicef-irc.org/research/113/478/>

¹⁵ ILO (2021) 'Child labour, Global Estimates 2020, Trends and The Road Forward', can be accessed here: https://www.ilo.org/wcmsp5/groups/public/---ed_norm/---ipec/documents/publication/wcms_797515.pdf. and Carter & Roelen (2017).

¹⁶ UNESCO (2019) 'New Methodology Shows that 258 Million Children, Adolescents and Youth are out of school', can be accessed here: <https://uis.unesco.org/sites/default/files/documents/new-methodology-shows-258-million-children-adolescents-and-youth-are-out-school.pdf>

Table 4 *Child labour: national level indicator values and corresponding benchmarks*

Indicator	Indicator type	Indicator value	Benchmarked risk level
Children in employment (% of children aged 7-14) ¹⁷	Direct indicator	0%	0
		0-1.5%	1
		1.5-5%	2
		5-10%	3
		10-20%	4
		>20%	5
Average working hours of children, ages 7-14 (hours per week) ¹⁸	Severity indicator	0	0
		0-5	1
		5-12	2
		12-15	3
		15-20	4
		>20	5
Children out of school, primary education ¹⁹	Severity indicator	0%	0
		0-2%	1
		2-5%	2
		5-10%	3
		10-17%	4
		>17%	5
Percentage of children aged 5-17 years engaged in child labour ²⁰	Direct indicator	0%	0
		0-1.5%	1
		1.5-5%	2
		5-10%	3
		10-20%	4
		>20%	5

National indicator weights used in calculation of national risk score in step 1 of the human rights risk assessment methodology retrieved from the factor analysis

The following weights were retrieved from the factor analysis:

Table 5 *Child labour: national level indicator weights*

Indicator	Weight
Children in employment (% of children ages 7-14)	50%
Average working hours of children	7%
Children out of school, primary	10%
Percentage of children engaged in child labour	33%

Subnational indicators for calculating the subnational risk scores in steps 2 and 3 of the human rights risk assessment methodology

For the calculation of subnational risk-scores we use two proxy indicators: 'the expected years of schooling at age 6' (Global data lab),²¹ as well as the 'mean of the educational attendance variables for all age classes between 6 and 17' (Global data lab).²² For the latter indicator, there are four different variables, each for a different age category covering three years (ages 6-8, 9-11, 12-25 and 15-17). Taking the mean of these age categories assumes that the population size within each age class is equal, which is not always the case

¹⁷ <https://data.worldbank.org/indicator/SL.TLF.0714.ZS>

¹⁸ <https://data.worldbank.org/indicator/SL.TLF.0714.WK.TM>

¹⁹ <https://data.worldbank.org/indicator/SE.PRM.UNER>

²⁰ <https://data.unicef.org/resources/dataset/percentage-children-aged-5-14-years-engaged-child-labour-sex-place-residence-household-wealth-quintile/>

²¹ <https://globaldatalab.org/>

²² <https://globaldatalab.org/>

in reality. However, the estimated effect of this inaccuracy on the overall risk score is relatively small, and not worth the effort of matching with population figures since the year of the sub-national indicators differs from country to country.

The sub-national fractions of the national median are calculated for both indicators separately. The mean of the two fractions is then taken for each sub-national region. In **Table 6** we present the correction categories and the cut-off points for the combined correction categories.

Table 6 *Child labour: subnational correction categories*

Deviation from the national median	Correction category	No. of regions in each category	% of regions in each category
>1.175	Large decrease (-1)	68	5
1.1-1.175	Medium decrease (-0.67)	73	5
1.03-1.1	Small decrease (-0.33)	236	18
0.971-1.03	No change	560	42
0.847-0.971	Small increase (+0.33)	292	22
0.739-0.847	Medium increase (+0.67)	60	4
<0.739	Large increase (+1)	54	4

Because the two proxy indicators are quite related to the concept we are trying to measure, we decided that the maximum deviation from the national score based on subnational differences should be +1 or -1.

Standardised literature review conducted for the purpose of the commodity risk score assessment in step 4 of the human rights risk assessment methodology

Standardised set of questions

The following section outlines the standardised list of questions that informs the literature study to assess of the risk on child labour in the production of a specific commodity within a particular country. The researcher builds upon the information in the commodity-production database to answer the following question: *is there (sufficient, reliable, direct or indirect) qualitative information for the risk of child labour at production level (commodity, agricultural sector, nation)?* Appendix 2 provides detailed information on reliability criteria of literature sources.

1. Start with a simple quick and dirty online inquiry to search for **direct and reliable information** linking the commodity AND country AND theme (max. 10 minutes, using google, google Scholar, Scopus and Web of Science). In order to verify whether there is **direct** and **reliable** evidence linking the risk theme to the commodity and country.
 - a. yes (min. of 2 sources, see reliability criteria) → go to 'benchmarking table' (risk level: 4.5 or 5).
Based on the criteria in the benchmarking table the researcher might want to look for additional reliable sources on specific 'criteria' to be able to establish the risk level.
 - b. no → proceed to question 2.
Suggested search terms for child labour: e.g. child labour, child employment
2. Is the [commodity] in [country] listed by USDOL as a good produced by child labour? (*check the USDOL list of goods and the USDOL Report on 'Findings on the Worst forms of Child Labour' for the focus country*)
 - a. Yes → proceed to question 4b, hereafter go to 'benchmarking' (risk level 3 or higher) Based on the criteria in the benchmarking table the researcher might want to look for additional sources on specific 'criteria' to be able to establish the risk level.
 - b. No → proceed to question 3
3. Is the agricultural sector highlighted as a risk sector for child labour according to the USDOL 'Findings on the Worst forms of Child Labour' in [country]?
Yes → proceed question 4.
No (USDOL does indicate there is no risk in the sector) → no increased risk. Do not proceed to question 4. → go to benchmarking to establish risk level < 3

Based on the criteria in the benchmarking table the researcher might want to look for additional sources on specific 'criteria' to be able to establish the risk level.

NO (country is not in USDOL) □ look for 2 sources that can reliably assess the risk for child labour in the agricultural sector (if possible related to commodity) in [country] (see reliability criteria)

- ➔ Two sources *do indicate* the presence of a risk in the agricultural sector → proceed to question 4 a and b.
 - ➔ Two sources do not give a clear picture on the prevalence of the risk in the agricultural sector in the focus country → look for additional sources.
 - ➔ Two sources *indicate* there is no risk in the sector → no increased risk. Do not proceed to question 4. → go to 'benchmarking' (risk level <3)
 - ➔ There are no sources available on the risk of child labour in [country] → maintain national score
4. Based on the information in the commodity-production database and the production systems and cultivation methods in the focus country, answer the following questions:
- a. is there literature that identifies 'child labour opportunities' in the production of [commodity]? (in general: is there evidence of child labour in other countries when producing [commodity]?)
 - b. Does the country's production system and cultivation methods enable the involvement of children in the production of [commodity]?
 - i. Yes to both: activities identified & 'enabling' production system. Proceed to 'Benchmarking' (level: 3.5 or 4)
 - ii. Yes to either a or b: Proceed to Benchmarking (level: 3, 3.5 or 4)
 - iii. No: no activities identified and no 'enabling production system.' Proceed to benchmarking (level 1-3)
 - iv. Unknown: There are *no sources available* on the risk of child labour in the agricultural sector. No meaningful assessment possible. Please note that this situation is least desirable. In most cases the researcher is able to build upon information in the commodity production database, information sources that are used to assess other risk themes and sometimes information that has been used to assess other commodity sectors in the same focus country. By combining this information a meaningful assessment of this theme can still be possible and a score can be assigned. It might that this information will only become available when engaging in inter- and intra country cross-check

The researcher will record the information derived from the literature review, guided by the questions above, in a stand-alone thematic conclusion that is recorded in an excel file.

Standardised set of assessment criteria ('benchmarking table') for the theme of child labour

The researcher builds upon the 'stand-alone thematic conclusion' and the commodity-production database and consults a table with assessment criteria ('benchmarking table') to match the thematic conclusions with specified risk level. It can be that the researcher needs to consult some additional sources to determine the right risk level or make an informed judgement on the risk level when the descriptions of the risk level characteristics do not match the specific case. In the latter situation, a justification of choice between two risk levels is made explicit in the thematic descriptions and verified by the second reviewer.

The benchmarking table below provides the standardised set of assessment criteria for the theme of child labour.

Table 7 Assessment criteria for child labour literature study conclusions

Risk Level		Characteristics
0	Does not exist	NA
0.5		Characteristics of the production of the commodity do not allow for involvement of child labour. Commodity-specific national risk score is < 1
1	Very low risk	Characteristics of the production of the commodity do not allow for involvement of child labour. Commodity-specific national risk score is < 1.5
1.5		Children are very unlikely to be involved in the production of the specific commodity, due to type of activities associated with the production of the commodity. No evidence of child labour in focus country. Commodity-specific national risk score is < 2
2	Low risk	Children are very unlikely to be involved in the production of the specific commodity, due to type of activities associated with the production of the commodity. There is no evidence of child labour in focus country. Commodity-specific national risk score is < 3
2.5		Children are unlikely to be involved in the production of the specific commodity due to: type of activities associated with the production of the commodity AND a country's production system/cultivation methods. There is limited evidence*** of child labour in focus country (no high prevalence). Indicative: commodity-specific national risk score is < 3.0.
3	Medium risk ('a risk')	Children are unlikely to be involved in the production of the specific commodity due to: the type of activities associated with the production of the commodity OR the country's production systems/cultivation methods. Yet, there is evidence*** of child labour in focus country (prevalence). Indicative: commodity-specific national risk score is < 3.5.
3.5		Children are likely to be involved in the production of the specific commodity. Characteristics of the production of the commodity allow for child labour, but tasks would not be hazardous AND there is evidence*** of child labour in the focus country (implying medium prevalence). However, there is not sufficient direct evidence of child labour in the production of the commodity in the focus country. Indicative: the focus country can have some degree of law enforcement on child labour (but this might not follow international standards)
4	High risk ('high chance')	Children are likely to be involved in the production of the specific commodity. Characteristics of the production of the commodity allow for child labour, activities could be hazardous AND there is sufficient evidence*** of child labour in agricultural sector in the focus country (implying medium - high prevalence). However, there is not sufficient direct evidence* for child labour in the production of the commodity. Indicative: the focus country can have some degree of law enforcement on child labour (but this might not follow international standards)
4.5		There is sufficient direct evidence* that children are involved in the production of the specific commodity , tasks can involve hazardous activities (but does not need to be that way) . Child labour is not to be found in all production systems** . Scores on other human right risk themes indicate a higher vulnerability of children. Indicative: focus country might know weak law enforcement.
5	Very high risk ('very likely')	There is sufficient direct evidence* that children are involved in the production of the specific commodity in the focus country, tasks involve hazardous activities . Child labour is widespread** in the production of the commodity. Child labour is likely to interfere with schooling . Scores on other human right risk themes indicate high vulnerability of children. Indicative: focus country might know weak law enforcement .

* with (sufficient) direct evidence we mean at least two credible sources (additional to USDOL) that child labour takes place in the production of the commodity in the focus country. See also the reliability criteria in Appendix 2. USDOL is not considered to be direct evidence. But when being on the USDOL list risk-level cannot be lower than 3.

** refers to prevalence of child labour in the production systems of a specific commodity in a country.

*** refers to prevalence of child labour in the agricultural sector in the focus country. USDOL can be the basis for this assessment following the percentage of child labour per sector, the amount of different commodities that are associated with child labour etc.

2.4.2 Forced labour



Forced Labour

Definition Forced labour can be defined as 'all work or service which is exacted from any person under the menace of any penalty and for which the said person has not offered himself voluntarily' (ILO convention 29, 1930).^{xii} Forced labour can take different forms (debt bondage, trafficking and other forms of modern slavery), it can be imposed by different actors (state, private and individuals), can be observed in different types of economic activities and takes place all over the world. Following the ILO,

Forced Labour encompasses the 'traditional' practices of forced labour as debt bondage, slavery and slave-like practices but also 'new forms' of forced labour such as human trafficking. The concept of modern slavery is frequently used to refer to this broader category of forced labour practices (ILO, n.d.).^{xiii}

National indicators for calculating the national risk score in step 1 of the human rights risk assessment methodology

We identified 3 national indicators to capture the risk of forced labour, these are one direct indicators: 'Estimated Population in Modern Slavery',²³ one severity indicator: 'Vulnerability Score'²⁴ and one legal framework indicator 'Government Response Score'.²⁵ The direct indicator 'Estimated Population in Modern Slavery' assesses forced labour prevalence in a country. The 'Vulnerability Score' is indirect indicator (index) that assesses the severity of the theme by indicating the level of vulnerability to forced labour in a country. The legal framework indicator 'Government Response Score' is an index that shows the effort level of national governments to respond to and prevent forced labour.

The 'Estimated Population in Modern Slavery', the 'Vulnerability Score' and the 'Government Response Score' are retrieved from the Walk Free Foundation's [Global Slavery Index](#). The 'Vulnerability Score' measures the level of which a country's population is vulnerable to modern slavery, and covers the dimensions governance issues, lack of basic needs, inequality, disenfranchised groups, and effects of conflicts. Poor performance on these dimensions is associated with increased risk of modern slavery. 'Government Response Score' indicate the extent to which a country's government implements laws, policies and programmes to prevent and respond to modern slavery. This includes the support for victims, criminal justice mechanisms, coordination at borders, institutions and regulations on sourcing goods produced by forced labour. Note that not all of these elements are directly taken over from the Global Slavery Index methodology. This will be explained further below and in Appendix 1.

Several considerations were part of the selection of these indicators. First, the direct indicator provides data on modern slavery, is an umbrella term that includes worst forms of child labour, sexual exploitation, forced marriage, human trafficking and bonded labour. This means that, if we use the estimated number of people in modern slavery for as a proxy for forced labour, the data is confounded by information that does not represent information we want to capture in this national score. Nevertheless, literature shows that in areas where socioeconomic and legal conditions allow for modern slavery issues, forced labour is usually maintained by these same conditions. For that reason, and since it is also the only available data showing prevalence per country with high geographical coverage, it has been decided to keep the estimation as a proxy for forced labour prevalence, but accompanied by other indicators to provide a more nuanced estimation of the risk score.

Second, the Vulnerability Score and the Government Response Score are both retrieved from the same data source that provides the Estimated Population in Modern Slavery estimates, being the Walk Free Foundation. Using the majority of indicators from the same data source might give a too one-sided image of the human rights risk score. However, the Walk Free Foundation is a renowned organisation specialised in modern slavery that updates its Global Slavery Index (which consists of the Population, Vulnerability and Government Response Scores) frequently, accompanied with a clear and transparent methodology, which guarantees an up to date methodology for this national score calculation in the future. Furthermore, the Scores are compiled with a substantial set of information coming from databases such as the World Bank, FAO, Vision of Humanity, etc.

²³ <https://www.walkfree.org/global-slavery-index/#:~:text=An%20estimated%2050%20million%20people,modern%20slavery%20for%20160%20countries.>

²⁴ <https://www.walkfree.org/global-slavery-index/>

²⁵ <https://www.walkfree.org/global-slavery-index/>

Third, the Walk Free Foundation's Global Slavery Index open access methodology allows us to adjust the calculations of the Government Response Score to better represent the forced labour risk in commodity production. The unadjusted Score contains indicators regarding child labour, sexual exploitation and governmental regulations on commodity sourcing from countries vulnerable to bonded labour, which are indicators that we want to exclude from the forced labour risk score calculation. Therefore, we recalculated the Government Response Score by excluding indicators that bias the forced labour score calculations. For more information on this decision making, see Appendix 1.

Benchmarking of national indicators used for calculation of national risk score in step 1 of the human rights risk assessment methodology

For benchmarking the 'Estimated Population in Modern Slavery' indicator (see table below), it has been decided to follow the Global Slavery Index's (GSI) method of allocating benchmark values to indicator outcomes.²⁶ The decision has been reached after observing the range of values, distribution of countries for different risk levels, average risk levels per region and other information. GSI's approach developed 10 risk categories that seem to be consistent with on the ground realities related to the theme. We have rescaled GSI's ten categories to 5 risk categories consistent with our approach. We have decided not to make quintiles as these resulted in the cut-off values too restrictive at the higher levels of the risks and difficult to interpret these risks in the context of several countries we were knowledgeable about that should have had high risk of forced labour as per these categories. No other reference scales were found to confidently decide on the benchmarks for this indicator. For benchmarking the 'Vulnerability Score' and 'Government Response Score,' similar to Walk Free Foundation's data representation, equal bins of values are used as benchmarking cut-off values, since both scores have equally spread outcomes for all values ranging equally between 0 and 100 and 0 and 1 respectively.

Table 8 *Forced labour: national level indicator values and corresponding benchmarks*

Indicator	Indicator type	Indicator value	Benchmarked risk level
Estimated Population in Modern Slavery ²⁷	Direct indicator	0	0
		0-1.4‰	1
		1.4-4.6‰	2
		4.6-6.2‰	3
		6.2-12.6‰	4
		>12.6‰	5
Vulnerability Score ²⁸	Severity indicator	0	0
		0-20	1
		20-40	2
		40-60	3
		60-80	4
		>80	5
Government Response Score ²⁹	Legal framework indicators	1	0
		0.8-1	1
		0.6-0.8	2
		0.4-0.6	3
		0.2-0.4	4
		0-0.2	5

The final national score was further adjusted based on the ratification of ILO's Migrant Workers Convention 1975.³⁰ If the national risk score based on the three indicators above is 3 or higher, the national score was

²⁶ <https://www.globallslaveryindex.org/2018/data/maps/#prevalence>

²⁷ <https://www.walkfree.org/global-slavery-index/#:~:text=An%20estimated%2050%20million%20people,modern%20slavery%20for%20160%20countries.>

²⁸ <https://www.walkfree.org/global-slavery-index/>

²⁹ <https://www.walkfree.org/global-slavery-index/>

³⁰ https://www.ilo.org/dyn/normlex/en/f?p=1000:11300:0::NO:11300:P11300_INSTRUMENT_ID:312263

decreased by 0.1 if the two conventions are signed. If the national risk score based on the 3 indicators is below 3, the score is decreased by 0.2 if both conventions are signed.

National indicator weights used in calculation of national risk score in step 1 of the human rights risk assessment methodology retrieved from the factor analysis

As described in the general approach, we used a factor analysis to determine the indicator weights. However, because the results were not satisfactory, we adjusted the approach. The latent variable we were trying to capture using the factor analysis should give the highest weight to the estimated population in modern slavery, as this is the only direct indicator that we have. After trying multiple estimation methods we were not able to get this result from the factor analysis, and the vulnerability score consistently received a slightly higher weight than the estimated population in modern slavery. Based on our conceptual knowledge of the theme and the indicators, we therefore decided to switch the weights of these two indicators. This leads to the following weights being used for the calculation of the national score:

Table 9 *Forced labour: national level indicator weights*

Indicator	Weight
Estimated Population in Modern Slavery	47%
Vulnerability Score	40%
Government Response Score	13%

Subnational indicators for calculating the subnational risk scores in steps 2 and 3 of the human rights risk assessment methodology

The national risk score for forced labour is comprised of four different indicators, none of which is available at subnational level, therefore we use a proxy indicator for the calculation of forced labour risk at subnational level.

We therefore look at subnational differences in migration from the migration data portal³¹ as a proxy indicator to establish the subnational difference in the risk of forced labour. As research shows that there is a strong relation between migrant workers and the risk of forced labour or other types of labour exploitation (see e.g. Zimmermann & Kiss, 2017). To get correction categories that broadly follow a normal distribution, we look at the fraction of the national median. The limited access to networks, information or resources, contrasted with employers with superior knowledge and control or resources, enables the employers to exploit the migrants with relative low costs and risks. We draw on this notion by assuming that subnational entities with more (less) migration than the national average, have a higher (lower) risk than the national average. This immigration is expressed as a percentage of the subnational population. The national score represents the risk of forced labour, which already covers the national level of immigration. Higher levels of immigration are reflected in the national data, which is already given a risk score. This is why we use the relative level of immigration of a subnational entity compared to the median level of immigration of all the subnational units of that country, to make the national score higher or lower for that specific region.

For migration data on the subnational level, we use estimations of migration flows from Ceaşu et al. (2019) which models subnational level migration inflows and outflows. They modelled this for 121 countries. They provide a dataset with 160 million observations, representing the flows between every subnational unit included in their study. We used inflow data only and aggregated all the inflow, regardless of the entity of origin. Ceaşu et al. (2019) use socio-economic characteristics of subnational entities, and apply relationships estimated on international migration data, scaled with national migration data.

1. One major cause of concern was the age of the data used, as the data concerns 2010 estimations. And this conflicts with the quality criteria we have developed as ground rule for the indicator selection. However, this proxy indicator did represent the only viable option to engage in an assessment of subnational risk, we did validate the relevance of this data for the current situations, guided by the following two questions: How do these estimations approximate reality in ~2010?
2. Is the data from ~2010 still relevant for 2023 and further?

³¹ <https://hub.worldpop.org/geodata/summary?id=50577>

1. How far are estimations from reality?

Data: Measure of actual migration flow is 'largely limited to OECD countries'³². UNSD provides a database³³ of varying flow measurements (border patrol, new registrations, censuses, household surveys, etc.), presented in the yearbook. Data from border patrol or new registrations of foreigners seem to be the best proxy of flow, available for Argentina and Ecuador. Indonesia has a good record of actual migration inflow between 2010 and 2015. We tried to get data around 2010 or a few years before, as the migration data portal tries to make their data representable of the 2005-2010 period.

- Ecuador: according to our migration data portal, the (international) inflow is 94,000. The border police/border control reports 194,000 in 2010. Meaning, our estimate is in the same order of magnitude, but it is underestimating it. A close look at definitions (is illegal immigration recorded in Ecuador, is illegal immigration included in the estimations?) could help to explain the differences.
- Indonesia: according to our migration data portal, the (international) inflow is 425,000. This could be an overestimation, but again in the same order of magnitude. The UNSD database gives 292 thousand as inflow with the purpose of employment in 2015 (excluding business travellers. Including these and tourists etc it is 9.2 million). This is actually based³⁴ on inflow, rather than net-stock comparisons.
- Argentina: Total international immigration into ARG according to our data: 284,000. This is not unreasonable compared to the total migration (net) stock growth: 199,000 in 5 years, a growth of 40,000 per year (immigrants-emigrants-passed away's). UNSD inflow data based on register of foreigners gives the same order of magnitude: lower, but that is not surprising since it excludes unregistered migration: 83,000 in 2021, 100,000 in 2010. So, our migration data could be an overestimation.

Our data seems to overestimate the immigration in Argentina and Indonesia and underestimate it in Ecuador. But it is in the same order of magnitude.

2. Is the data from ~2010 still relevant for 2023 and further?

Signs of changing patterns or trend break: Colombia immigrant stock exploded, due to a large inflow of Venezuelan immigrants since 2019. From 130 thousand in 2010, to 1.9 million in 2020. Ethiopia shows a clear trend break compared to 2005-2010 going from a declining stock to a growing stock: from 569 thousand to 1.1 million.³⁵

Conclusion: Our data is generally reliable, but we detected exceptions for Colombia and Ethiopia. The impact of new conflicts after 2020 on migration patterns is not reflected in this dataset and should still be considered. However, migration is inherently volatile and heavily influenced by global events. Despite these limitations, we have decided to proceed with the data while advising users to interpret subnational data with caution. Additionally, since migration alone does not capture all causes of forced labour, we are capping the subnational correction at -0.6 or +0.6 relative to the national score.

In **Table 10** below we present the correction categories and the cut-off points for the correction categories.

Table 10 Forced labour: subnational correction categories

Deviation from the national median	Correction category	Nr of regions in each category	% of regions in each category
<0.44	Large decrease (-0.6)	59	5%
0.44-0.61	Medium decrease (-0.4)	87	7%
0.61-0.83	Small decrease (-0.2)	216	18%
0.83-1.2	No change	468	39%
1.2-1.81	Small increase (+0.2)	226	19%
1.81-2.74	Medium increase (+0.4)	83	7%
>2.74	Large increase (+0.6)	59	5%

³² <https://www.migrationdataportal.org/themes/international-migration-flows>

³³ <http://data.un.org/Data.aspx?d=POP&f=tableCode%3a400>

³⁴ <https://unstats.un.org/unsd/demographic-social/meetings/2017/bangkok--international-migration-data/Session%204/Session%204%20Indonesia.pdf>

³⁵ <https://ourworldindata.org/migration> (from United Nations Department of Economic and Social Affairs). These UNDESA stock figures are the basis of our migration portal estimates data.

Standardised literature review conducted for the purpose of the commodity risk score assessment in step 4 of the human rights risk assessment methodology

Standardised set of questions

The following section outlines the standardised list of questions that informs the literature study to assess the risk of forced labour risk in the production of a specific commodity within a particular country. The researcher builds upon the information in the commodity-production database to answer the following question: *is there (sufficient, reliable, direct or indirect) qualitative information for the risk of forced labour at production level (commodity, agricultural sector, nation)?* Appendix 2 provides detailed information on reliability criteria of literature sources.

1. Start with a simple quick and dirty online inquiry to search for **direct** and **reliable** information linking the commodity AND country AND theme (max. 10 minutes, using Google, Google Scholar, Scopus and web of science). In order to verify whether there is direct and reliable evidence linking the risk theme to the commodity and country. Here you can also quickly consult the USDOL list of goods.
 - a. Yes (min. of 2 sources, see reliability criteria) → go to 'benchmarking table' (risk level: 4.5 or 5)
Based on the criteria in the benchmarking table the researcher might want to look for additional reliable sources on specific 'criteria' to be able to establish the risk level.
 - b. no → proceed to question 2.Suggested search terms for forced labour: forced labour, slavery, debt bondage
2. Does the US Department of State's [country] human rights report identify the prevalence of forced labour in the agricultural sector in the focus country?
 - a. **Yes** --> proceed to question
 - b. **No** → look for 2 sources to assess the risk for forced labour in the agricultural sector (if possible related to the commodity) in [country] (see reliability criteria)
 - i. Two sources do indicate the presence of a risk → proceed to question 3a and b.
 - ii. Two sources do not give a clear picture on the prevalence of the risk in the agricultural sector in the focus country → look for additional sources.
 - iii. Two sources do indicate NO presence of a risk in the sector → no increased risk. Do not proceed to question 3. Go to 'benchmarking table' (level < 3)
 - iv. There are no sources available on the risk of forced labour in [country]: leave national score as it is.
3. Based on the information in the commodity-production database and knowledge on the production systems, cultivation methods and workforce in the focus country, answer the following questions:
 - a. is there literature that indicates a higher likeliness of forced labour in the production of [commodity] by characteristics of the production systems, cultivation methods and the workforce in [country]?
 - b. Is there literature that indicates a higher prevalence of forced labour in the main [commodity] producing regions?

Yes -> proceed to 'benchmarking table' (level 3, 3.5, 4)

No → proceed to 'benchmarking table' (level < 3)

Unknown → There are *no sources available* on the risk of forced labour in the agricultural sector. No meaningful assessment possible. Please note that this situation is least desirable. In most cases the researcher is able to build upon information in the commodity production database, information sources that are used to assess other risk themes and sometimes information that has been used to assess other commodity sectors in the same focus country. By combining this information a meaningful assessment of this theme can still be possible and a score can be assigned. It might that this information will only become available when engaging in inter- and intra country cross-check.

The researcher will record the information derived from the literature review, guided by the questions above, in a stand-alone thematic conclusion that is recorded in an excel file.

Standardised set of assessment criteria for the theme of forced labour

The researcher builds upon the 'stand-alone thematic conclusion' and the commodity-production database and consults a table with assessment criteria ('benchmarking table') to match the thematic conclusions with specified risk level. It can be that the researcher needs to consult some additional sources to determine the right risk level or make an informed judgement on the risk level when the descriptions of the risk level

characteristics do not match the specific case. In the latter situation, a justification of choice between two risk levels is made explicit in the thematic descriptions and verified by the second reviewer.

The table below provides the standardised set of assessment criteria for the theme of forced labour.

Table 11 Assessment criteria for forced labour literature study conclusions

Risk Level		Characteristics
0	Does not exist	NA
0.5		Characteristics of the production of the commodity do not allow for the involvement of forced labour. No vulnerable groups involved in the production of the commodity. No evidence of forced labour in focus country. Commodity-specific national risk score is < 1
1	Very low risk	Characteristics of the production of the commodity do not allow for forced labour. No vulnerable groups involved. No evidence of forced labour in focus country. Commodity-specific national risk score is < 1.5
1.5		It is very unlikely that forced labour takes place in the production of the commodity due to the type of activities associated with the commodity and no vulnerable groups being involved in the production of the commodity. No evidence of forced labour in the focus country. Commodity-specific national risk score is < 2
2	Low risk	It is very unlikely that forced labour takes place in the production of the commodity due to the type of activities associated with the commodity and it is unlikely that vulnerable groups take part in/form a big share of the workforce in the production of the commodity. No evidence of forced labour in focus country. National risk score is < 3
2.5		Forced labour is unlikely to take place in the production of the commodity. There are some examples of forced labour in focus country but not very unlikely/not widespread in the agricultural sector . Vulnerable groups*** involved in the production of commodity but do not form a big share of the workforce. Commodity-specific national risk score is < 3.
3	Medium risk ('a risk')	Forced labour could occur but is unlikely to take place in the production of the commodity due to a combination of the following characteristics: <ul style="list-style-type: none"> • the specific characteristics of the production of the commodity make it unlikely that forced labour is used in the production of the commodity • There are examples of forced labour in the focus country but these are not widespread • There are examples of forced labour in the focus country but these are not representative for the commodity • However, vulnerable groups*** involved in the production of commodity. • Commodity-specific national risk score < 3.5 (<i>indicative, not a requirement</i>)
3.5		There is indirect evidence for forced labour based on a combination of the following characteristics: <ul style="list-style-type: none"> • There is direct evidence on the usage of forced labour in the agricultural sector; • But the usage of forced labour in the agricultural sector is not widespread (implying low – medium prevalence, in terms of people and sectors) • The characteristics of the production of the commodity allow for the usage of forced labour in the production of the commodity • However, there is not sufficient direct evidence of forced labour in production of the specific commodity. • Vulnerable groups*** are an important share of the workforce producing the commodity • Commodity risk scores for the themes of discrimination and insufficient remuneration indicate these groups face a vulnerable position for forced labour. <p>Forced labour is present in the country and the agricultural sector. But examples are not widespread (in terms of prevalence and severity). There is no direct evidence of forced labour in production of the commodity. However, vulnerable groups*** are part of the workforce producing the commodity. Therefore, one cannot assume the risk is low.</p>

Risk Level		Characteristics
4	High risk ('high chance')	<p>There is indirect evidence for forced labour in the production of the commodity, based on a combination of the following characteristics:</p> <ul style="list-style-type: none"> • There is (sufficient and reliable) direct evidence on the usage of forced labour in the agricultural sector; • There are examples of the usage of forced labour in multiple commodity sectors in the country (implying medium - high prevalence, in terms of people and sectors). • The characteristics of the production of the commodity allow for the usage of forced labour in the production of the commodity • However, there is not sufficient direct evidence of forced labour in production of the specific commodity. • Vulnerable groups*** are an important share of the workforce producing the commodity • Commodity risk scores for the themes of discrimination and insufficient remuneration indicate these groups face a vulnerable position for forced labour.
4.5		<p>There is sufficient direct evidence* for the usage of forced labour in the production of the commodity. But the usage of forced labour does not need to be widespread**.</p> <p>Supporting criteria for assessment:</p> <ul style="list-style-type: none"> • vulnerable groups*** are an important share of the workforce • Commodity risk scores for the themes of discrimination and insufficient remuneration indicate these groups face a vulnerable position for forced labour.
5	Very high risk ('very likely')	<p>There is sufficient direct evidence* for the usage of forced labour in the production of the commodity. The usage of forced labour is widespread** in the production of the commodity.</p> <p>Supporting criteria for assessment:</p> <ul style="list-style-type: none"> • vulnerable groups*** are an important share of the workforce • Commodity risk scores for the themes of discrimination and insufficient remuneration indicate these groups face a vulnerable position for forced labour.

* with (sufficient) direct evidence we mean at least two credible sources (additional to USDOL/USDOS) indicate that forced labour takes place in the production of the commodity in the focus country. USDOL/USDOS is not considered to be direct evidence. But when the commodity is mentioned by USDOL or USDOS the risk-level cannot be lower than 3. See also the reliability criteria.

** refers to prevalence of forced labour in the production systems of a specific commodity in a country.

***With vulnerable groups we mean: women, youth, migrants, seasonal workers, religious groups, minority groups (incl. ethnic groups and LGBTIQ+) or indigenous peoples.

Specific note on interpretation of qualitative data in relation to forced labour:

- What distinguishes bad working conditions from forced labour? Following the reasoning presented in ILO (2024) forced labour refers involuntary work imposed through coercion. Both conditions must be present simultaneously to constitute forced labour. The ILO provides a long list of circumstances that lead to involuntary work (in recruitment, employment, and employment separation) and common forms of coercion that can be used to inform the assessment of this theme.³⁶
- Out grower schemes are common practice in the agricultural sector and can, but don't need to, lead to situations of debt bondage. For the assessment of this theme it is important to take in mind that the mere presence of out grower schemes in a commodity sector or specific country is not considered to be a structural forced labour risk. Only when the literature study reveals that these out grower schemes are associated with serious maltreatment these will be incorporated in the assessment to represent a risk for debt bondage and therefore are included in the assessment of the risk.

What distinguishes bad working conditions vs. Forced labour; add: debt bondage in out grower systems is not a structural risk only when evidence of maltreatment is found.

2.4.3 Discrimination



Definition The ILO defines Discrimination as follows: 'Discrimination is any distinction, exclusion or preference made on the basis of race, colour, sex, religion, political opinion, national extraction or social origin, which has the effect of nullifying or impairing equality of opportunity or treatment in employment or occupation. The terms employment and occupation include access to vocational training, access to employment and to particular occupations, and terms and conditions of employment' (ILO convention 111, 1958).^{xiv} The United Nations Officer for High Commission

³⁶ <https://www.ilo.org/publications/hard-see-harder-count-handbook-forced-labour-surveys>

emphasises that discrimination is often directed at groups who are vulnerable and disadvantaged in the society. The vulnerable groups in this case include women, minorities, migrants, people with disability and indigenous peoples. Discrimination could also be against any individual's race, religion, sexual orientation and gender identity.

National indicators for calculating the national risk score in step 1 of the human rights risk assessment methodology

We identified three national indicators to capture the risk of child labour, these are three legal framework indicators: 'Legal protection from workplace discrimination';³⁷ 'Social institutions and gender discrimination'³⁸ and 'CPIA policies for social inclusion/equity'.³⁹ There are no indicators directly measuring discrimination at workplace that did meet our data selection criteria. Several databases, however, measure and index gender discrimination and policies targeting workplace discrimination.

The legal framework indicator 'Legal protection from workplace discrimination' is composed of different variables relevant to the workplace discrimination theme collected by the World Policy Analysis Centre (WPC). The WPC evaluates laws, policies and rights in 193 countries in different areas amongst others health to income, care, and education. The database is systematically updated with the latest data being released in 2023. One of the areas is workplace discrimination that includes assessment of prohibition of workplace discrimination based on ethnicity, migrant status and other characteristics. A final index score is assigned to each of these variables. We have pooled together all relevant variables measuring workplace discrimination and averaged their index value to arrive at one indicator value per country. The list of selected variables can be found in Appendix 5.

The legal framework indicator 'Social institutions and gender discrimination' is composed of selected variables provided by the OECD's Gender Institutions and Development Database (GID-DB). The index was launched in 2009 and is updated every 2-5 years. The aim of the index is to 'measures discrimination against women in social institutions across 179 countries'.⁴⁰ Similarly to the 'Workplace Discrimination' indicator, we assessed and identified those variables within the GID-DB index that are relevant for the theme of workplace discrimination or discrimination in general and complementary to other indicators selected for this theme. In other words, variables that mention discrimination or workplace discrimination in the variable name and included those that were complementary to the 'Legal protection from workplace discrimination' and the 'CPIA policies for social inclusion/equity' indicators. We selected 6 different variables that span across themes on restricted access to productive and financial resources, restricted civil liberties and discrimination. The list of selected GID-DB variables can be found in Appendix 5. Based on this selection we have calculated a mean value per country.

The third legal framework indicator is the 'Country Policy and Institutional Assessment' (CPIA) composed by the World Bank as part of the CPIA database funded by the International Development Association (IDA). The assessment is carried out annually. The CPIA provides an index value based on country performance assessed against 16 criteria to capture how socially inclusive and equitable policies are with regards to gender, use of public resources, social protection, and labour.

Important to note is that the selection of national and subnational indicators may reflect gender biases due to limitations in data availability and coverage. However, we have accounted for these limitations in the standardised literature review (Step 4) by incorporating qualitative and contextual insights on broader discrimination issues and focusing on risk-increasing factors such as presence of vulnerable groups, such as women, migrant workers, youth, and others. This approach allows us to complement the quantitative indicators with a general understanding ensuring a more comprehensive analysis.

³⁷ <https://www.worldpolicycenter.org/topics/equal-rights-and-discrimination/workplace-discrimination/policies>

³⁸ [https://data-](https://data-explorer.oecd.org/vis?df[ds]=DisseminateFinalDMZ&df[id]=DSD_GID%40DF_GID_2023&df[ag]=OECD.DEV.NPG&dq=.....&lom=L)

[explorer.oecd.org/vis?df\[ds\]=DisseminateFinalDMZ&df\[id\]=DSD_GID%40DF_GID_2023&df\[ag\]=OECD.DEV.NPG&dq=.....&lom=L](https://data-explorer.oecd.org/vis?df[ds]=DisseminateFinalDMZ&df[id]=DSD_GID%40DF_GID_2023&df[ag]=OECD.DEV.NPG&dq=.....&lom=L)

³⁹ <https://data.worldbank.org/indicator/IQ.CPA.SOCI.XQ>

⁴⁰ <https://www.oecd.org/en/data/dashboards/social-institutions-gender-index.html#:~:text=The%20OECD%20Development%20Centre's%20Social,social%20institutions%20across%20179%20countries.>

Benchmarking of national indicators used for calculation of national risk score in step 1 of the human rights risk assessment methodology

Given that all indicators are indexes, we follow their ranges to decide on the benchmark levels. In other words, if the indicator value was 0 -being the lowest indicator value- and this implied strong legislative framework and an indicator value 5 -being the highest indicator value- implied very weak policy, we assigned to value 0 the lowest risk score and 5 to the highest risk score. In case of the CPIA, the directionality of the index values is opposite – 1 indicates the lowest performance and 6 the highest performance. Here, we have rescaled the values to fit the 0-5 range and adapted the directionality to fit our approach.

Table 12 *Discrimination: national level indicator values and corresponding benchmarks*

Indicator	Indicator type	Indicator value	Benchmarked risk level
Legal protection from workplace discrimination (WPC) ⁴¹	Legal framework indicator	0	0
		0-1	1
		1-2	2
		2-3	3
		3-4	4
		>4	5
Social institutions and gender discrimination (GID-DB) ⁴²	Legal framework indicator	0	0
		0-1	1
		1-2	2
		2-3	3
		3-4	4
		>4	5
CPIA policies for social inclusion/equity (WB) ⁴³	Legal framework indicator	6	0
		6-5	1
		5-4	2
		4-3	3
		3-2	4
		<2	5

National indicator weights used in calculation of national risk score in step 1 of the human rights risk assessment methodology retrieved from the factor analysis

The following weights were retrieved from the factor analysis:

Table 13 *Discrimination: national level indicator weights*

Indicator	Weight
Legal protection from workplace discrimination	64%
Social institutions and gender discrimination	26%
CPIA policies for social inclusion/equity	10%

Subnational indicators for calculating the subnational risk scores in steps 2 and 3 of the human rights risk assessment methodology

For the calculation of the subnational risk scores we use two proxy indicators: 'the relative difference between men and women in terms of being employed (having worked in the last 12 months)', as well as 'the relative difference between men and women in terms of land ownership'.⁴⁴ These indicators were chosen as

⁴¹ <https://www.worldpolicycenter.org/topics/equal-rights-and-discrimination/workplace-discrimination/policies>

⁴² [https://data-explorer.oecd.org/vis?df\[ds\]=DisseminateFinalDMZ&df\[id\]=DSD_GID%40DF_GID_2023&df\[ag\]=OECD.DEV.NPG&dq=.....&lom=LASTNPERIODS&lo=5&to\[TIME_PERIOD\]=false](https://data-explorer.oecd.org/vis?df[ds]=DisseminateFinalDMZ&df[id]=DSD_GID%40DF_GID_2023&df[ag]=OECD.DEV.NPG&dq=.....&lom=LASTNPERIODS&lo=5&to[TIME_PERIOD]=false)

⁴³ <https://data.worldbank.org/indicator/IQ.CPA.SOCI.XQ>

⁴⁴ dhsprogram.com

they are related to both employment as well as smallholder farming, and because we were able to find aligned subnational data on these indicators for a large enough number of countries. We were not able to find any subnational data related to other types of discrimination, and as gender discrimination is one of the main forms of discrimination, we decided to use these two indicators as proxies for wider subnational differences in discrimination. For both of the indicators we divide the share of men by the share of women meeting the requirement. For regions where women were more often employed or land owners we assumed 'gender equality' for these two indicators, and recoded values as such (in other words: any values below 1 were recoded to 1). The sub-national fractions of the national median are calculated for both indicators separately. The mean of the two fractions is then taken for each sub-national region. In **Table 14** below we present the correction categories and the cut-off points for the correction categories.

Table 14 *Discrimination: subnational correction categories*

Deviation from the national median	Correction category	Nr of regions in each category	% of regions in each category
<0.25	Large decrease (-1)	7	3%
0.25-0.5	Medium decrease (-0.67)	17	7%
0.5-0.8	Small decrease (-0.33)	37	15%
0.8-1.4	No change	69	29%
1.4-2	Small increase (+0.33)	54	23%
2-4	Medium increase (+0.67)	45	19%
>4	Large increase (+1)	10	4%

Because the two proxy indicators are quite related to the concept we are trying to measure, we decided that the maximum deviation from the national score based on subnational differences should be +1 or -1.

Standardised literature review conducted for the purpose of the commodity risk score assessment in step 4 of the human rights risk assessment methodology

Standardised set of questions

The following section outlines the standardised list of questions that informs the literature study to assess of the risk on discrimination in the production of a specific commodity within a particular country. The researcher builds upon the information in the commodity-production database to answer the following question: *is there (sufficient, reliable, direct or indirect) qualitative information for the risk of discrimination at production level (commodity, agricultural sector, nation)?* Appendix 2 provides detailed information on reliability criteria of literature sources.

1. Start with a simple quick and dirty online inquiry to search for **direct and reliable information** linking the commodity AND country AND theme (max. 10 minutes, using google, Google Scholar, Scopus and web of science). In order to verify whether there is direct and reliable evidence linking the risk theme to the commodity and country.
 - a. yes → (min. of 2 sources, see reliability criteria) → go to 'benchmarking table' (risk level: 4.5 or 5). Based on the criteria in the benchmarking table the researcher might want to look for additional reliable sources on specific assessment criteria to be able to establish the risk level.
 - b. no → proceed to question 2.

Suggested search terms for discrimination: gender, women, inequality, migrants, indigenous, youth, ethnic groups, wage-gap
2. Based on the information on the [country]'s production system(s), cultivation methods and workforce, does the literature review indicate that specific vulnerable groups* are a structural** and considerable*** share of the workforce in the production of [commodity]? *Look for 2 credible literature sources that can assess this question (might be combined with Q3). See also: reliability criteria.*

Yes → go to 'benchmarking'

No → Two reliable sources do *indicate* that vulnerable/disadvantaged groups *do not participate* in the production of [commodity]. → go to 'benchmarking table'

UNKNOWN → There are *no sources available* on the risk of discrimination in the production of [commodity]. Go to question 3.

3. Based on the information of [country] specific production systems, cultivation methods and workforce, does the literature indicate that specific vulnerable groups* are a structural** and considerable*** share of the workforce in the agricultural sector as a whole? *Look for 2 credible literature sources that can assess this question (might be combined with Q2). See also: reliability criteria.*

Yes → go to 'benchmarking table.'

No (neutral) → Two sources *do indicate* vulnerable/disadvantaged groups *do not participate* in the agricultural sector. → go to 'benchmarking table'

UNKNOWN → There are *no sources available* on the risk of discrimination in the agricultural sector. No meaningful assessment possible. Please note that this situation is least desirable. In most cases the researcher is able to build upon information in the commodity production database, information sources that are used to assess other risk themes and sometimes information that has been used to assess other commodity sectors in the same focus country. By combining this information a meaningful assessment of this theme can still be possible and a score can be assigned. It might that this information will only become available when engaging in inter- and intra country cross-check.

The researcher will record the information derived from the literature review, guided by the questions above, in a stand-alone thematic conclusion that is recorded in an excel file.

Standardised set of assessment criteria for the theme of discrimination

The researcher builds upon the 'stand-alone thematic conclusion' and the commodity-production database and consults a table with assessment criteria ('benchmarking table') to match the thematic conclusions with specified risk level. It can be that the researcher needs to consult some additional sources to determine the right risk level or make an informed judgement on the risk level when the descriptions of the risk level characteristics do not match the specific case. In the latter situation, a justification of choice between two risk levels is made explicit in the thematic descriptions and verified by the second reviewer.

The table below provides the standardised set of assessment criteria for the theme of discrimination.

Table 15 *Assessment criteria for discrimination literature study conclusions*

Risk Level	Characteristics
0	Does not exist
0.5	Discrimination is not likely to take place in the production of the commodity . There is direct evidence that vulnerable groups are not involved in the production of the commodity . Commodity-specific national risk score < 1
1	Very low risk Discrimination is very unlikely to take place in the production of the commodity. There is direct evidence that vulnerable groups are not involved in the production of the commodity . Commodity-specific national risk score < 1.5.
1.5	Discrimination is very unlikely to take place in the production of the commodity. There is direct evidence that vulnerable groups are not involved in the production of the commodity . Commodity-specific national risk score < 2
2	Discrimination is unlikely to take place in the production of the commodity or the agricultural sector. There is indirect evidence that vulnerable groups are not structurally and not considerably involved in the production of the commodity. Commodity-specific national risk score < 2.5 .
2.5	Discrimination is unlikely to take place in the production of the commodity. There is no direct evidence for discrimination in the sector. There only a small involvement of the vulnerable groups in the production of the commodity. Commodity-specific national risk score < 3.5 .
3	Medium risk ('a risk') Discrimination is unlikely to take place in the production of the commodity , there is no direct evidence . But some characteristics of the production systems do indicate some increased risk. Here, two of the following characteristics are combined: <ul style="list-style-type: none"> • There is some evidence of discrimination in the wider agricultural sector • OR There is evidence that traditional gender relations place a discriminative role in society. Combined with

Risk Level	Characteristics
3.5	<ul style="list-style-type: none"> • OR the commodity risk score for the theme of forced labour score > 3 • OR vulnerable groups do make a considerable part*** of the workforce of the sector • OR vulnerable groups are structurally involved in the sector. • OR production characteristics do allow for the participation of vulnerable groups. <p>It is likely that discrimination takes place in the production of the commodity but there is no direct evidence.</p> <p>There is indirect evidence for the risk:</p> <ul style="list-style-type: none"> • direct evidence of discrimination in the wider agricultural sector OR the commodity-specific national risk score for discrimination > 3 • There is indirect evidence that traditional gender relations play a role in society (and can be related to the agricultural sector) • direct evidence of the structural involvement** of vulnerable groups in the wider agricultural sector • Vulnerable groups do not need to be a considerable*** part of the work force in the agricultural sector • Production characteristics make participation of vulnerable groups likely. <p>Cross-checking with other risk scores:</p> <ul style="list-style-type: none"> • If commodity risk score for forced labour is high, discrimination is likely to be high as well
4	<p>High risk ('high chance')</p> <p>It is likely that discrimination takes place in the production of the commodity but there is no direct evidence (or not sufficient)</p> <p>There is indirect evidence for the risk:</p> <ul style="list-style-type: none"> • Direct evidence of discrimination in the wider agricultural sector. • There is indirect evidence that traditional gender relations play a discriminative role in society (and can be related to the agricultural sector) • Direct evidence of the structural involvement** of vulnerable groups in wider agricultural sector • Vulnerable groups are a considerable*** part of the work force in the agricultural sector • Production characteristics of commodity make participation of vulnerable groups likely. <p>Cross-checking with other risk scores:</p> <ul style="list-style-type: none"> • If commodity risk score for forced labour is high, discrimination is likely to be high as well. This score on forced labour can be reflected in the benchmarking of the commodity.
4.5	<p>Sufficient direct evidence of discrimination in the production of commodity.</p> <p>OR sufficient direct evidence of discrimination in the wider agricultural sector AND sufficient direct evidence of the participation of vulnerable groups in the production of the commodity.</p> <p>The vulnerable group is structurally involved** but does not need to be a considerable*** part of the workforce.</p> <p>Cross-checking with other risk scores:</p> <ul style="list-style-type: none"> • If commodity risk score for forced labour is high, discrimination is likely to be high as well. This score on forced labour can be reflected in the benchmarking of the commodity.
5	<p>Very high risk ('very likely')</p> <p>Sufficient direct evidence of discrimination and the production of the commodity.</p> <p>OR sufficient direct evidence of discrimination in the wider agricultural sector AND sufficient direct evidence of the participation of vulnerable groups in the production of the commodity.</p> <p>These vulnerable groups are structurally involved** AND make a considerable*** part of the workforce.</p> <p>Cross-checking with other risk scores:</p> <ul style="list-style-type: none"> • If commodity risk score for forced labour is high, discrimination is likely to be high as well

* With vulnerable groups we mean: women, youth, migrants, seasonal workers, religious groups, minority groups (incl. ethnic groups and LGBTIQ+) or indigenous peoples.

**Structurally involved: not incidental participation (note: seasonal labour that uses labour of a specific vulnerable group every season = structural)

***Considerable: > 30% of workforce of specific production stages (expert judgement)

2.4.4 Violence and harassment

Definition The definition used for violence and harassment is based on the ILO. 'Everyone has the right to work free from violence and harassment, including gender-based violence and harassment. The elimination of violence and harassment in employment and occupation are part of the foundations of the rule of law.' (ILO Convention 190, 2019).^{xv} We assess the risk based on likelihood of violence and harassment occurring at place of work and the legislative protection against it included in national law.



Violence and harassment

National indicators for calculating the national risk score in step 1 of the human rights risk assessment methodology

We identified four national indicators to capture the risk of child labour, there is one direct indicator: 'Lloyd's register selected indicators on occupational violence';⁴⁵; one legal framework indicator 'Legal protection from (sexual) harassment and violence (WPC)';⁴⁶ and two proxy indicators 'Prevalence of intimate partner violence (WHO & SIGI)'⁴⁷ and 'Prevalence of intimate partner violence (SIGI)'.⁴⁸

The direct indicator 'Lloyd's register selected indicators on occupational violence' comes from the World Risk Poll funded by the Lloyd's Register Foundation, which represents the results of interviews across 142 countries regarding violence and threats of violence at work among other topics. Within the database we have selected two questions that were deemed relevant to the theme, being: whether a respondent directly experienced themselves violence and/or physical abuse at workplace, and whether a respondent witnessed violence and/or physical abuse at workplace. If the respondent answered yes to at least one of the questions, we assigned a value of 1 to these observations, all else got a value of 0. Based the created dummy variable, we have calculated a share of respondents that were subjected to or experienced violence and/or physical abuse at the workplace per country to arrive at the final indicator. Hence, our final indicator is the share of respondents that either experienced themselves or witnessed violence and/or physical abuse at workplace per country.

Two proxy indicators, 'prevalence of intimate partner violence (WHO & SIGI)' and 'prevalence of intimate partner violence (SIGI)', have been selected for the assessment of the theme. These two indicators focus on the prevalence of intimate partner violence and have been chosen to be included since many of the sectors studied include family labour. In that sense, violence taking place at home is closely related to where production is taking place. For each country, we calculated the average of the two indicators to serve as a proxy for workplace violence. It is this average that is then benchmarked. Herein, it is assumed that higher prevalence of domestic violence is associated with higher prevalence of violence at work.

The last indicator is a legal framework indicator that originates from the index Workplace 'Gender Discrimination and Sexual Harassment' by the World Policy Centre (WPC), which indicates the adequacy of national legislation to prevent and act upon workplace gender discrimination and sexual harassment. For calculating the national risk score we adjusted the index by only selecting variables that measure legislation on harassment, in order to prevent confoundedness with the theme discrimination. We have harmonised the index scores and rescaled to 0-5 scale. The final value of the WPC indicator is therefore a mean value of values per each of the selected policies index values.

Benchmarking of national indicators used for calculation of national risk score in step 1 of the human rights risk assessment methodology

The 'Lloyd's register selected indicators on occupational violence' was benchmarked based on the range of values, distribution of countries for different risk levels and the correlation of the risk scores with intimate partner violence values. For prevalence of intimate partner violence, we looked at reports and studies discussing trends in intimate partner violence, and regional differences.⁴⁹ We have looked further into reports on gender equality to capture other issues related to intimate partner violence and their global distribution,

⁴⁵ https://www.ilo.org/global/publications/WCMS_863095/lang--en/index.htm

⁴⁶ <https://www.worldpolicycenter.org/events-launches/preventing-workplace-discrimination-and-sexual-harassment>

⁴⁷ https://www.who.int/data/gho/data/themes/topics/sdg-target-5_2_1-eliminate-violence-against-women-and-girls

⁴⁸ <https://www.oecd.org/stories/gender/social-norms-and-gender-discrimination/sigi/dashboard>

⁴⁹ Such as https://iris.who.int/bitstream/handle/10665/85239/9789241564625_eng.pdf?sequence=1 and <https://iris.who.int/bitstream/handle/10665/341604/WHO-SRH-21.6-eng.pdf?sequence=1>

such as existence of laws protecting women from domestic abuse to better understand which countries and regions are more prone to domestic violence.⁵⁰ By examining these regional and country-level differences, we assessed how these trends translated into intimate partner prevalence numbers to inform our benchmark values. For the indicator 'Legal protection from (sexual) harassment and violence,' WPC assesses the strength of the legislative framework protecting workers from harassment. This involves an implicit scoring system. For example, in the variable 'Does legislation explicitly prohibit discriminatory workplace harassment based on race/ethnicity?', WPC categorises results into levels, ranging from 'no prohibition' (indicating the highest risk) to 'Yes, race/ethnicity-specific prohibition' (indicating the lowest risk).

Table 16 *Violence and harassment: national level indicator values and corresponding benchmarks*

Indicator	Indicator type	Indicator value	Benchmark
Lloyd's register selected indicators on occupational violence ⁵¹	Direct indicator	0	0
		0-0.05	1
		0.05-0.2	2
		0.2-0.35	3
		0.35-0.5	4
		>0.5	5
Prevalence of intimate partner violence (WHO & SIGI) ⁵²	Proxy indicator	0%	0
		0-5%	1
		5-10%	2
		10-20%	3
		20-30%	4
		>30%	5
Prevalence of intimate partner violence (SIGI) ⁵³	Proxy indicator	0%	0
		0-5%	1
		5-10%	2
		10-20%	3
		20-30%	4
		>30%	5
Legal protection from (sexual) harassment and violence (WPC) ⁵⁴	Legal framework indicator	5	0
		4	1
		3	2
		2	3
		1	4
		0	5

National indicator weights used in calculation of national risk score in step 1 of the human rights risk assessment methodology retrieved from the factor analysis

When running the factor analysis on the three remaining indicators (after combining the two intimate violence prevalence indicators) alone, almost 100% of the weights went to intimate partner violence, whereas when looking at the weights of the first factor when conducting the factor analysis on all 4 variables, our direct indicator received the highest weight. We therefore used these weights, but excluded the comprehensiveness of the legal framework indicator, since we already had another legal framework indicator in any case. The final weights used are:

⁵⁰ Such as <https://datatopics.worldbank.org/sdcatlas/archive/2017/SDG-05-gender-equality.html>

⁵¹ https://www.ilo.org/global/publications/WCMS_863095/lang--en/index.htm

⁵² https://www.who.int/data/gho/data/themes/topics/sdg-target-5_2_1-eliminate-violence-against-women-and-girls

⁵³ <https://www.oecd.org/stories/gender/social-norms-and-gender-discrimination/sigi/dashboard>

⁵⁴ <https://www.worldpolicycenter.org/events-launches/preventing-workplace-discrimination-and-sexual-harassment>

Table 17 Violence and harassment: national level indicator weights

Indicator	Weight
Lloyd's register selected indicators on occupational violence	52%
Average intimate partner violence (WHO & SIGI and SIGI indicators)	44%
Legal protection from (sexual) harassment and violence (WPC)	4%

Standardised literature review conducted for the purpose of the commodity risk score assessment in step 4 of the human rights risk assessment methodology

Standardised set of questions

The following section outlines the standardised list of questions that informs the literature study to assess of the risk on child labour in the production of a specific commodity within a particular country. The researcher builds upon the information in the commodity-production database to answer the following question: *is there (sufficient, reliable, direct or indirect) qualitative information for the risk of violence & harassment at production level (commodity, agricultural sector, nation)?* Appendix 2 provides detailed information on reliability criteria of literature sources.

1. Start with a simple online search for **direct and reliable information** linking the commodity AND country AND theme (max. 10 minutes, using: google, google Scholar, Scopus and web of science). In order to verify whether there is direct and reliable evidence linking the risk theme to the commodity and country.
 - a. yes (min. of 2 sources, see reliability criteria) → go to 'benchmarking table' (risk level: 4.5 or 5). Based on the criteria in the benchmarking table the researcher might want to look for additional reliable sources on specific assessment criteria to be able to establish the risk level.
 - b. no → proceed to question 2.

Suggested search terms for violence and harassment: violence, harassment, abuse, women, vulnerable groups*, (violent) conflict

Suggested to compare thematic conclusion with data for the themes 'discrimination' and 'access to land and material resources'

2. Based on the information on the [country]'s production systems, cultivation methods and workforce, does the literature review indicate that specific vulnerable groups* are a structural** and considerable share*** of the workforce in the production of [commodity]? *Look for 2 reliable literature sources that can assess this question (might be combined with Q3). See also: reliability criteria.*

Yes → go to 'benchmarking table'

No → Two reliable sources do *indicate* that vulnerable/disadvantaged groups *do not participate* in the production of [commodity] → go to 'benchmarking table'

UNKNOWN □ There are *no sources available* on the risk of violence and harassment in the production of [commodity]. Go to question 3.

3. Based on the information of [country] specific production systems, cultivation methods and workforce, does the literature indicate that specific vulnerable groups* are a structural** and considerable*** share of the workforce in the agricultural sector as a whole? *Look for 2 reliable literature sources that can assess this question (might be combined with Q2). See also: reliability criteria*

Yes → go to 'benchmarking table'

No (neutral) → Two sources *do indicate* vulnerable/disadvantaged groups *do not participate* in the agricultural sector. → Go to 'benchmarking'

UNKNOWN □ There are *no sources available* on the risk of violence and harassment in the agricultural sector. No meaningful assessment possible. Please note that this situation is least desirable. In most cases the researcher is able to build upon information in the commodity production database, information sources that are used to assess other risk themes and sometimes information that has been used to assess other commodity sectors in the same focus country. By combining this information, a meaningful assessment of this theme can still be possible, and a score can be assigned. It might that this information will only become available when engaging in inter- and intra country cross-check.

Standardised set of assessment criteria

The researcher builds upon the 'stand-alone thematic conclusion' and the commodity-production database and consults a table with assessment criteria ('benchmarking table') to match the thematic conclusions with

specified risk level. It can be that the researcher needs to consult some additional sources to determine the right risk level or make an informed judgement on the risk level when the descriptions of the risk level characteristics do not match the specific case. In the latter situation, a justification of choice between two risk levels is made explicit in the thematic descriptions and verified by the second reviewer.

The table below provides the standardised set of assessment criteria for the theme of violence and harassment.

Table 18 Assessment criteria for violence and harassment literature study conclusions

Risk Level	Characteristics
0	Does not exist
0.5	Violence & Harassment is not likely to take place in the production of the commodity. There is direct evidence that vulnerable groups are not involved in the production of the commodity. National risk score < 1
1	Very low risk Violence & Harassment is very unlikely to take place in the production of the commodity. There is direct evidence that vulnerable groups are not involved in the production of the commodity. National risk score < 1.5.
1.5	Violence & Harassment is very unlikely to take place in the production of the commodity. There is direct evidence that vulnerable groups are not involved in the production of the commodity. National risk score < 2
2	Violence & Harassment is unlikely to take place in the production of the commodity or the agricultural sector. There is indirect evidence that vulnerable groups are not structurally and considerably involved in the production of the commodity. National risk score < 2.5.
2.5	Violence & Harassment is unlikely to take place in the production of the commodity. Some examples of V&H exist for the wider agricultural sector. But there is no direct evidence of the involvement of the vulnerable groups in the production of the specific commodity. National risk score is < 3.5.
3	Medium risk ('a risk') Violence & Harassment is unlikely to take place in the production of the commodity , there is no direct evidence . But some characteristics of the production systems do indicate some increased risk. Here, two of the following characteristics are combined: <ul style="list-style-type: none"> • There is some evidence of violence and Harassment in the wider agricultural sector • OR The national risk score for Violence and Harassment is > 3.0**** • OR there is evidence that (Intimate partner) violence is a profound problem in society. Combined with: <ul style="list-style-type: none"> • OR vulnerable groups are a considerable*** part of the workforce of the agricultural sector • OR vulnerable groups are structurally involved** in the agricultural sector • OR the production characteristics do allow for the participation of vulnerable groups (incl. cross-checking with commodity risk scores for the themes of forced labour and discrimination; includes cross-checking with other sectors in the same country).
3.5	It is likely that Violence and Harassment takes place in the production of the commodity, but there is no direct evidence. There is indirect evidence for the risk: <ul style="list-style-type: none"> • Direct evidence of violence and harassment in the wider agricultural sector • OR The national risk score for Violence and Harassment is > 3.0**** There is indirect evidence that (intimate partner) violence is a problem (and can be related to the commodity sector) • Direct evidence of the structural involvement** of vulnerable groups in the wider agricultural sector • Vulnerable groups do not need to be a considerable*** part of the workforce in the agricultural sector • Production characteristics make the participation of vulnerable groups likely (incl. cross-checking with commodity risk scores for the themes of forced labour and discrimination; includes cross-checking with other sectors in the same country).
4	High risk ('high chance') It is likely that Violence and Harassment takes place in the production of the commodity but there is no direct evidence (or not sufficient). There is indirect evidence for the risk:

Risk Level	Characteristics
	<ul style="list-style-type: none"> • Direct evidence of violence and harassment in the wider agricultural sector • There is indirect evidence that (Intimate partner) violence is a problem (and can be related to the commodity sector). • Direct evidence for the structural involvement ** of vulnerable groups in the wider agricultural sector • Vulnerable groups are a considerable *** part of the workforce in the agricultural sector • Production characteristics of commodity make participation of vulnerable groups likely (incl. cross-checking with commodity risk scores for the themes of forced labour and discrimination; includes cross-checking with other sectors in the same country).
4.5	<p>Sufficient direct evidence of Violence and Harassment and the production of the commodity.</p> <p>OR direct evidence of V&H in the wider agricultural sector AND direct evidence of the participation of vulnerable groups in the production of the commodity. These vulnerable groups are structurally involved** but do not need to be a considerable*** part of the workforce.</p> <p>Cross-checking with other risk scores:</p> <ul style="list-style-type: none"> • National risk score on violence & Harassment > 3.0 **** • Commodity risk score for the theme of forced labour • Commodity risk score for the theme of discrimination
5	<p>Very high risk ('very likely')</p> <p>Sufficient direct Evidence of Violence and Harassment and the production of the commodity.</p> <p>OR direct evidence of V&H in the wider agricultural sector AND direct evidence of the participation of vulnerable groups in the production of the commodity. These vulnerable groups are structurally involved** AND make a considerable*** part of the workforce.</p> <p>Cross-checking with other risk scores:</p> <ul style="list-style-type: none"> • National risk score on violence & Harassment > 3.0 **** • Commodity risk score for the theme of forced labour • Commodity risk score for the theme of discrimination

* With vulnerable groups we mean: women, youth, migrants, seasonal workers, religious groups, minority groups (incl. ethnic groups and LGBTIQ+) or indigenous peoples.

**Structurally involved: not incidental participation (note: seasonal labour that uses labour of a specific vulnerable group every season = structural)

***Considerable: > 30% of workforce of specific production stages (expert judgement)

**** Note: this criterium is not a minimum requirement to end up in risk level 3. It means that if you have a national risk score for the theme which is 3 or higher, this in combination with one of the next criteria this can lead to a commodity risk score of 3 (or higher). Indicative.

Specific note on interpretation of qualitative data in relation to violence and harassment:

- The theme 'violence and harassment' concerns violence at the workplace and violence that can interact with the workplace and therefore have impact at the level of production /on the workforce. The latter would include situations of (armed) conflict, including insurgency or criminal violence that does impact or is likely to have an impact on production localities/the workforce.
- In the due diligence dashboard we will develop a separate recommendation on 'heightened human rights due diligence' to deal with situation of (active) armed conflict. More is to be found in Appendix 7 of this document.

2.4.5 Freedom of association and collective bargaining



Definition Freedom of association is a fundamental human right that is part of the Universal Declaration of Human Rights of 1948. It enables the participation of non-state actors (including trade unions) in economic and social policy. The ILO defines freedom of association as 'the right of workers and employers to form and join organisations of their own choosing' (ILO Convention 87, 1948).^{xvi} Collective bargaining is closely linked to freedom of association and is defined as 'a key means through which employers and their organisations and trade unions can establish fair wages and working conditions,

and ensure equal opportunities between women and men' (ILO convention 98, 1949).^{xvii} These rights are central in the functioning of effective labour markets and governance structures in a country.

National indicators for calculating the national risk score in step 1 of the human rights risk assessment methodology

We identified three national indicators to capture the risk of lack of freedom of association and collective bargaining: one legal framework indicator, 'Level of compliance with labour rights';⁵⁵ and two direct indicators, the 'ITUC global rights index'⁵⁶ and the highest value of either the 'collective bargaining coverage rate'⁵⁷ or the 'trade union density rate'.⁵⁸

The first (direct) indicator is calculated by taking the highest value of either the 'trade union density rate' or the 'collective bargaining coverage rate' of a country, both are coming from ILO databases. We decided to use only the highest value as both rates are usually close to each other and for countries with large differences between both, it is assumed that labourers are protected by either one of the labourer protection measures (International Labour Organization, 2022).⁵⁹ Collective bargaining coverage rates represent the percentage of a country's working work force that is enrolled in a collective and voluntary agreement between the employer or sector and a group of employees. Trade union density rates represent the percentage of a country's working work force that is a member of a sector related or general workers union. Both indicators are good proxies for the level of freedom to associate and collectively bargain within a country, but some nuances have to be made to provide the national score calculations. First, ILO only has access to worker data working in formal sectors, meaning that the two rates don't include informal workers in the calculation. This leads to an overestimation of the trade union density and collective bargaining rates in countries with large informal sectors.⁶⁰ Second, countries with strong social security legal frameworks often show either slightly lower collective bargaining or trade union density rates, or both. According to ILO, workers feel more secured by the government's strong social legal frameworks, and see less necessity in becoming union members if their contracts are or are not negotiated in collective bargaining, even though they are free to do so. This leads to an underestimation of this level of freedom in countries with strong legal frameworks. Third, whether or not workers are free to be enrolled in collective bargaining or union memberships does not indicate the level of effectivity of these enrolments. This is influenced by different country characteristics such as the level of government involvement of the private sector, transparency of the government, governmental influence in worker unions, etc.

The second indicator is a legal framework indicator: the 'Level of National Compliance with Fundamental Rights at Work (Freedom of Association and Collective Bargaining) (SDG 8.8.2).' This indicator was created by ILO and measures the degree of adherence to freedom of association and the proper acknowledgment of collective bargaining rights among all member states of the ILO, using information from textual sources of six ILO supervisory bodies. These sources contain the member state's ambition, progress and effectiveness regarding the ILO standards on freedom of association that they complied to. This indicator therefore goes beyond the trade union and collective bargaining rates by indicating the national government's effort to allow workers this freedom.

The third) indicator is a direct indicator, the 'Global Rights Index' from the International Trade Union Confederation (ITUC). This index indicates the compliance with collective labour rights at country level and the risk level of violating worker rights, which includes violations in law and in practice. ITUC is a global organisation executing empiric research on worker rights violations in 163, which adds practical observations of the compliance of labour rights to our national indicator.

⁵⁵ <https://ilostat.ilo.org/resources/concepts-and-definitions/description-sustainable-development-labour-market-indicators/about-sdg-indicator-8-8-2/>

⁵⁶ https://www.ituc-csi.org/IMG/pdf/ituc_globalrightsindex_2020_en.pdf

⁵⁷ <https://ilostat.ilo.org/topics/collective-bargaining/>

⁵⁸ <https://ilostat.ilo.org/topics/union-membership/>

⁵⁹ Trade union density and collective bargaining coverage rates have a correlation of 0.7. Some countries are exceptional and have a high collective bargaining coverage rates and a low trade union densities; the Netherlands, for example, has 75.6% and 15.4% respectively. In these countries, there is less need for joining trade unions as workers are well protected by national legislation and collective agreements. Using the highest value instead gives a fairer representation of the risk than taking, for example, the average.

⁶⁰ <https://ilostat.ilo.org/beyond-the-numbers-exploring-the-relationship-between-collective-bargaining-coverage-and-inequality/>

Benchmarking of national indicators used for calculation of national risk score in step 1 of the human rights risk assessment methodology

As the ILO's 'level of compliance with labour rights' index and the 'ITUC global rights index' are both indices estimated by the respective organisations, we decided to keep the valuation for benchmarking as it is. The 'collective bargaining and trade union density rate (highest)' indicator is benchmarked in the same way as done by social LCA methodologies such as the PSILCA method.

Table 19 Freedom of association and collective bargaining: national level indicator values and corresponding benchmarks

Indicator	Indicator type	Indicator value	Benchmark
Level of compliance with labour rights ⁶¹	Legal framework indicator	0-10	Original index value divided by 2
ITUC global rights index ⁶²	Direct indicator	1	0
		2	1
		3	2
		4	3
		5	4
		5+	5
Collective bargaining coverage rate ⁶³ and Trade union density rate ⁶⁴ (highest)	Direct indicator	100%	0
		80-100%	1
		60-80%	2
		40-60%	3
		15-40%	4
		< 15%	5

National indicator weights used in calculation of national risk score in step 1 of the human rights risk assessment methodology retrieved from the factor analysis

The following weights were retrieved from the factor analysis:

Table 20 Freedom of association and collective bargaining: national level indicator weights

Indicators	Weight
Level of compliance with labour rights	32%
ITUC global rights index	59%
Collective bargaining coverage rate and Trade union density rate (highest)	9%

Standardised literature review conducted for the purpose of the commodity risk score assessment in step 4 of the human rights risk assessment methodology

Standardised set of questions

* Please note that during the pilot phase, a decision was made to revise the assessment criteria. The guidelines below will be adjusted based on feedback at a later stage.

The following section outlines the standardised list of questions that informs the literature study to assess of the risk of a lack of freedom of association and collective bargaining in the production of a specific commodity within a particular country. The researcher builds upon the information in the commodity-production database to answer the following question: *is there (sufficient, reliable, direct or indirect)*

⁶¹ <https://ilostat ilo org/resources/concepts-and-definitions/description-sustainable-development-labour-market-indicators/about-sdg-indicator-8-8-2/>

⁶² https://www.ituc-csi.org/IMG/pdf/ituc_globalrightsindex_2020_en.pdf

⁶³ <https://ilostat ilo org/topics/collective-bargaining/>

⁶⁴ <https://ilostat ilo org/topics/union-membership/>

qualitative information for this risk at production level (commodity, agricultural sector, nation)? Appendix 2 provides detailed information on reliability criteria of literature sources.

1. **Is the situation in agricultural sector different from the national situation (= national risk score)?** Start with a simple quick and dirty online inquiry to search for **reliable information (direct and indirect) that can assess the FACB situation for the agricultural sector.**
 - o **Where to look for:**
 - **Is the nation-wide situation relevant for the sector?**
 - **Are there signs for government or industry repression at national level?**
 - **Is the workforce represented by the FACB situation?**
 - Account for different production systems (workers vs. farmers)
 - Account for vulnerable groups: women, youth, migrants, seasonal workers, religious groups, minority groups (incl. ethnic groups and LGBTIQ+) or indigenous peoples.
 - Account for informal labour
 - *Possible sources to start with: USDOS Human Rights Report for the country and ITUC website.*
 - o **Yes ->** the situation is different from the national situation, go to 'benchmarking table' Based on the criteria in the benchmarking table the researcher might want to look for additional reliable sources on specific assessment criteria' to be able to establish the risk level.
 - o **No ->** no, the situation is the same as the national situation, maintain national risk score.
 - o **Unknown ->** There are no sources available on the risk of freedom of association & collective bargaining in the agricultural sector. No meaningful assessment possible. Please note that this situation is least desirable. In most cases the researcher is able to build upon information in the commodity production database, information sources that are used to assess other risk themes and sometimes information that has been used to assess other commodity sectors in the same focus country. By combining this information a meaningful assessment of this theme can still be possible and a score can be assigned. It might that this information will only become available when engaging in inter- and intra country cross-check

The researcher will record the information derived from the literature review, guided by the questions above, in a stand-alone thematic conclusion that is recorded in an excel file.

Standardised set of assessment criteria

The researcher builds upon the 'stand-alone thematic conclusion' and the commodity-production database and consults a table with assessment criteria ('benchmarking table') to match the thematic conclusions with specified risk level. It can be that the researcher needs to consult some additional sources to determine the right risk level or make an informed judgement on the risk level when the descriptions of the risk level characteristics do not match the specific case. In the latter situation, a justification of choice between two risk levels is made explicit in the thematic descriptions and verified by the second reviewer.

The table below provides the standardised set of assessment criteria for the theme of freedom of association and collective bargaining.

Table 21 Assessment criteria for freedom of association and collective bargaining literature study conclusions

Risk Level	Characterisation
0	Does not exist
0.5	<p>There is direct evidence that both self-employed farmers and workers are free to join independent (trade) union independently. These unions are strong and effective. And represent the majority of the workforce. Work is formal.</p> <p>OR The workforce has other avenues* to exercise their right of freedom of association and collective bargaining. These are regarded strong and inclusive.</p> <p>There is no anti-union discrimination in the agricultural sector and no union repression by the government. Vulnerable groups are not present in the production of the commodity or do not present a majority of the sectoral workforce.</p>
1	Very low risk
	<p>There is direct evidence that both self-employed farmers and workers are free to join independent (trade) union independently of whether these workers belong to a vulnerable group or not.</p> <ul style="list-style-type: none"> • Agriculture, commodity group or commodity related (trade) unions or worker unions are present • OR The workforce has other avenues* to exercise their right of freedom of association and collective bargaining. These are regarded effective and inclusive. • Workers and/or farmers are free to join independent unions • Unions represent the workforce and work is formal. • These unions are strong and powerful • There is no anti-union discrimination in the agricultural sector and no union repression by the government.
1.5	<p>It is very likely that both self-employed farmers and workers are free to join independent (trade) union independently of whether these workers belong to a vulnerable group or not.</p> <p>There is direct evidence that:</p> <ul style="list-style-type: none"> • Agriculture, commodity group or commodity related (trade) unions or worker unions are present. These unions are effective and powerful • OR The workforce has other avenues* to exercise their right of freedom of association and collective bargaining. These are regarded effective and inclusive. • Unions represent the majority of the workforce and work likely to be formal. • There is no anti-union discrimination in the agricultural sector and no union repression by the government.
2	Low risk
	<p>There is evidence that:</p> <ul style="list-style-type: none"> • Agriculture, commodity group or commodity related (trade) unions or worker unions are present. These unions are moderately effective and powerful • OR The workforce has other avenues* to exercise their right of freedom of association and collective bargaining. These are moderately effective. • It is likely that workers and/or farmers are free to join independent unions • It is unlikely that a share of the workforce is not represented in trade unions or worker associations. • Work is likely to be formal. • There is no anti-union discrimination in the agricultural sector and no union repression by the government.
2.5	<p>There is evidence that:</p> <ul style="list-style-type: none"> • Agriculture, commodity group or commodity related (trade) unions or worker unions are present. These unions are moderately effective and powerful • OR The workforce has other avenues* to exercise their right of freedom of association and collective bargaining. These are moderately effective. • It is likely that workers and/or farmers are free to join independent unions • It is unlikely that a share of the workforce is not represented in trade unions or worker associations. • However, there might be informal work • There is no anti-union discrimination in the agricultural sector and no union repression by the government.

Risk Level		Characterisation
3	Medium risk ('a risk')	<p>There is evidence that:</p> <ul style="list-style-type: none"> • Agriculture related (trade) unions or worker unions are present. Unions are moderately effective but not very powerful. • OR The workforce might have other avenues* to exercise their right of freedom of association and collective bargaining. <ul style="list-style-type: none"> • There is some evidence that workers and/or farmers are free to join independent unions • A small share of the workforce might not be represented in trade unions or worker associations • There is some evidence that government or industry supported anti-union discrimination exists in the country
3.5		<p>There is evidence that:</p> <ul style="list-style-type: none"> • Agriculture related (trade) unions or worker unions are limited. Unions are not regarded strong or effective • The workforce might have other avenues* (but limited effective) to exercise their right of freedom of association and collective bargaining. • An important share of the workforce is not represented in trade unions or worker associations • Access to information as criterium • Government or industry supported anti-union discrimination exists in the agricultural sector.
4	High risk ('high chance')	<p>There is evidence that:</p> <ul style="list-style-type: none"> • Agriculture related (trade) unions or worker unions are limited • The workforce has no or no meaningful avenues* to exercise their right of freedom of association and collective bargaining • A considerable share of the workforce is not represented in trade unions or worker associations • Access to information as criterium • Unions are not regarded strong or effective • Government or industry supported anti-union discrimination exists in the agricultural sector.
4.5	Very high risk	<p>There is sufficient evidence:</p> <ul style="list-style-type: none"> • Agriculture related (trade) unions or worker unions are very limited • The workforce has no other avenue* to exercise their right of freedom of association and collective bargaining. • A considerable share of the workforce is not represented in trade unions or worker associations • Access to information as criterium <ul style="list-style-type: none"> • There is severe government-supported anti-union discrimination which can result in violence and abuse for any member of the workforce.
5	Very high risk ('very likely')	<p>There is sufficient evidence:</p> <ul style="list-style-type: none"> • Agriculture related (trade) unions or worker unions are limited or non-existent • The workforce has no other avenue* to exercise their right of freedom of association and collective bargaining. • A considerable share of the workforce is not represented in trade unions or worker associations • There is direct evidence for anti-union discrimination in the agricultural sector. • There is severe government-supported anti-union discrimination which can result in violence and abuse for any member of the workforce.

* Court, collective labour agreements.

2.4.6 Occupational health and safety



Definition Occupational health and safety refers to the right of workers to be protected from sickness, disease and injury arising from their employment (ILO conventions 187, 155 and 161; 2006,^{xviii} 1981,^{xix} 1985).^{xx} Examples are issues as unsafe buildings, not having the appropriate protection gear at the workplace and the work with toxic materials. Following the ILO,^{xxi} an occupational injury is defined as '*any personal injury, disease or death resulting from an occupational accident; an occupational injury is therefore distinct from an occupational disease, which is a disease contracted as a*

result of an exposure over a period of time to risk factors arising from work activity. A case of occupational injury is the case of one worker incurring an occupational injury as a result of one occupational accident.'

National indicators for calculating the national risk score in step 1 of the human rights risk assessment methodology

The approach used for occupational health and safety has significantly changed over time. In earlier versions of the human rights risk scores, the scores for occupational health and safety were strongly dependent on ILO indicators on occupational accidents and injuries indicators. These included fatal and non-fatal occupational injuries in agriculture as prevalence indicators, and the percentage of days worked lost due to cases of occupational injury with temporary incapacity for the agricultural sector. However, upon examining these indicators, we have detected similar issues as raised by other authors regarding reliability of this data.⁶⁵ We found large differences in the reported number of injuries depending on whether the data came from insurance or from administrative data, with countries reporting based on insurance data having much bit higher numbers on occupational injuries. At the same time, there appeared to be plenty of literature on occupational health and safety, which generated high-quality commodity risk scores through the standardised literature review. We therefore decided that we would use these scores as the main scores for occupational health and safety, as occupational health and safety is very dependent on the production characteristics of a specific commodity in any case, and to only use a proxy for the national risk scores. For this proxy we use selected indicators from the Global Health Security Index.⁶⁶ We use the following three index indicators, which are based on the attached sub-indicators:

1. Available human resources for the broader healthcare system
 - Doctors per 100,000 people
 - Nurses and midwives per 100,000 people
 - Updated health workforce strategy to address human resource shortfalls
2. Healthcare access
 - Access to healthcare
 - Constitutional guarantee of citizens' right to medical care
 - Access to skilled birth attendants (% of population)
 - Out-of-pocket health expenditures per capita, PPP (current international \$)
 - Paid medical leave
 - Guaranteed paid sick leave
 - Healthcare worker access to healthcare
 - Government prioritisation of care for healthcare workers during response
3. Public health vulnerabilities
 - Access to quality healthcare
 - Total life expectancy (years)
 - NCD mortality rate
 - Population aged 65+
 - Tobacco use (% of adults)
 - Level of adult obesity (%)
 - Access to potable water and sanitation
 - Access to potable water
 - Access to at least basic sanitation facilities
 - Public healthcare spending levels per capita
 - Domestic general government health expenditure per capita (PPP)
 - Trust in medical and health advice
 - Trust medical and health advice from the government
 - Trust medical and health advice from medical workers

Benchmarking of national indicators used for calculation of national risk score in step 1 of the human rights risk assessment methodology

We calculated the mean of these three index scores and divided the results into five equal groups (quintiles) to create a score ranging from 1 to 5. Since we are using established indexes with global coverage, the use of quintiles ensures unbiased benchmarking.

⁶⁵ Such as https://agronomy.emu.ee/wp-content/uploads/2019/09/AR2019_Vol17No5_Merisalu.pdf

⁶⁶ <https://ghsindex.org/>

Subnational indicators for calculating the subnational risk scores in steps 2 and 3 of the human rights risk assessment methodology

For the subnational adjustments we use a proxy indicator: the health insurance coverage from the DHS,⁶⁷ which is the only subnational indicator related to the state of the healthcare system, that is available for (close to) at least 100 countries, that we were able to find.

Table 22 Occupational health and safety: subnational correction categories

Deviation from the national median	Correction category	Nr of regions in each category	% of regions in each category
<0.5	Large decrease (-0.6)	11	4%
0.5-0.75	Medium decrease (-0.4)	22	9%
0.75-0.93	Small decrease (-0.2)	45	17%
0.93-1.08	No change	97	38%
1.08-1.25	Small increase (+0.2)	49	19%
1.25-1.5	Medium increase (+0.4)	23	9%
>1.5	Large increase (+0.6)	11	4%

Because the proxy indicator is not closely related to the concept we are trying to measure, especially since health insurance coverage may be particularly low for agricultural workers in general, we decided that the maximum deviation from the national score based on subnational differences should be +0.6 or -0.6.

Standardised literature review conducted for the purpose of the commodity risk score assessment in step 4 of the human rights risk assessment methodology

Standardised set of questions

The following section outlines the standardised list of questions that informs the literature study to assess of the risk on occupational health and safety issues in the production of a specific commodity within a particular country.

Unlike other human rights risk themes, the risk of occupational health and safety follows a slightly different approach. The agricultural sector is one of the most hazardous economic sectors, both in developing and industrialised countries (e.g. ILO, 2011; ILO, 2015; European Union, 2023).⁶⁸ The agricultural workforce is confronted with sector specific hazards due to the nature of the activities, working conditions related to the sector and related to the rural environment. As such the assessment of this risk theme allows for a high(er) degree of standardisation and starts with the assumption that occupational health and safety risks at the level of the agricultural level are always medium-high (risk level 3 and higher). Unless strong evidence of risk prevention/mitigation and enforcement are in place. Appendix 2 provides detailed information on reliability criteria of literature sources.

The researcher builds upon the information in the commodity-production database.

Suggested search terms for the theme Occupational Health and Safety: *occupational health, occupational safety, health & safety, (work-related) injuries, illness, death, occupational hazards, occupational risks; specific occupational hazards (e.g. pesticide use).*

1. Identify the most important OHS issues in the production of commodity **[recorded in commodity-production database]**. These (most important) OHS issues are most likely to be similar between different producing countries that share similarities in production systems and cultivation methods.

⁶⁷ <https://dhsprogram.com/>

⁶⁸ International Labour Organization (2011) Safety and Health in Agriculture. ILO code of practice. International Labour Office – Geneva. https://www.ilo.org/sites/default/files/wcmsp5/groups/public/@ed_dialogue/@sector/documents/normativeinstrument/wcms_161135.pdf and <https://www.ilo.org/resource/agriculture-hazardous-work-0> and <https://oshwiki.osha.europa.eu/en/themes/farm-safety-osh-issues> and <https://www.fao.org/rural-employment/work-areas/working-conditions/ru/>

Most common occupational health and safety risks in agriculture can be grouped in to three categories (based on ILO, 2011):

Causes, related to the type of activities performed, e.g.:

- Working with machinery and vehicles (e.g. tractors, harvesters, cutting and piercing tools)
- Working with animals (e.g. *transmissible animal diseases: infectious and parasitic diseases; accidents with animals*)
- Exposure to noise and vibration
- Ergonomic hazards (e.g. *inadequate equipment/tools, (prolonged) unnatural body position; heavy carrying, repetitive work and long working hours*)
- Exposure to dust and other organic substances, chemicals and infectious agents
 - hazardous chemicals: pesticides, fertilisers, antibiotics and other veterinarian products
 - toxic or allergenic agents: plants, flowers, dusts, animal waste, gloves (chrome), oils
 - carcinogenic substances or agents: certain pesticides such as arsenicals and phenoxy-acetic herbicides, UV radiations, parasitic diseases such as bilharziasis and fascioliasis

Working conditions common to the rural environment, e.g.:

- weather conditions
- contact with *wild and poisonous animals: insects, spiders, scorpions, snakes, certain wild mammals*
- remote locations

Working conditions common to the specific commodity sector (production system), e.g.

- Production targets,
- Excessive working hours
- low income
- confined spaces such as silos, pits, cellars and tanks
- Heights
- High level of informality

These risks can be further interpreted by several risk-increasing or mitigating factors, e.g.:

- General standards of working and living conditions of the workforce in the commodity sector
- Safety Measures, Protective Equipment and Hygiene facilities
- Work experience of workforce
- Preventive measures at sector-level (OHS standards and management systems)
- Preventive measures at country level (enforcement of OHS regulation)

Standardised set of assessment criteria

Based on the identification of the most common OHS issue in the commodity sector in the focus country the assessment of this human right risk follows a highly standardised format that accounts for the most severe or most likely risk in the commodity sector^{69xxii}. With severity we mean: What is the likely outcome? (gravity of impact: death, permanent disability, long term health outcomes; temporary disability, minor injury, irremediable character). With likelihood we mean: how often is the person exposed to the hazard? (e.g. daily, weekly, monthly, rarely). Severity receives greater weight than likelihood. The exposure to chemical circumstances such as pesticides is often identified as the most severe risk for the commodity sector. There is ample of evidence that excessive and wrongful use of pesticides creates serious impact on the environment and human health. Therefore, we developed a specific benchmarking table to ensure we benchmark the risk level for pesticide as 'most severe risk' consistently and account for the differences between producing countries. The assessment criteria for the second table were based on the systematic comparison of thematic conclusions for over >150 OHS risk scores for this theme covering 20 different commodity sectors.

⁶⁹ Here we follow the recommendations as set out in the OECD Guidance (2018), ILO code of practice (2011) and incorporated into the accepted text of the CSDDD (2024) to assess risk based on the severity and likelihood of an impact. *According to the OECD 'credible prioritisation' occurs on the basis of these two criteria. Severity is being assessed based on scale (number of affected individuals), scope (gravity of the impact) and irremediability (limits on the ability to restore). Likelihood takes into account factors such as the country context and the capacity of the company and business partners to adequately manage risk (e.g. this also entails for instance compliance with OECD guidelines and risks mitigation strategies). Severity has greater weighing than likelihood. More information: OECD (2011,2018,2022 and 2023); Shift (2014, 2015, 2016a, 2016b); United Nations (2011).*

General assessment criteria Occupational Health and Safety risks

Account for the most severe OHS risk identified

Likelihood	Rare: has rarely if ever happened	Unlikely: is possible, but is not expected to happen	Moderate: could be expected to happen once a year	Likely: will probably occur but is not persistent	Almost certain: occurs regularly
Severity					
Catastrophic: potentially fatal	4.5	4.5	4.5	5	5
Major: disabling injury or long-term health outcomes	4	4	4.5	4.5	5
Moderate: Semi-permanent injury or semi-permanent health outcome	3.5	3.5	3.5	4	4.5
Minor: short-term impact			3.5	4	4.5
Insignificant: no injury or ill health			3.5	4	4

Specific assessment criteria pesticide use

Risk increasing or decreasing factors on Severity <i>In most cases it is impossible to know which types of pesticides are applied at farm level</i>	Baseline risk level 4.5 <i>Assumes pesticide application is common practice in the specific commodity sector</i>	Risk increasing or decreasing factors on Likelihood <i>Make sector-specific judgement, account for the most severe (not likely) risk.</i>
Direct evidence of harmful impacts by pesticide use of the specific commodity sector (+) Direct evidence of usage of most harmful types of pesticides in the agricultural sector (use in commodity sector likely) (+)	Country is subject to EU regulation: baseline risk level 4 Commodity sector has a big share of organic production in focus country: baseline risk level 4	High mechanisation of pesticide application/precision agriculture (-) Evidence on frequency of pesticide application for the commodity sector (+ and -) Evidence of usage of protective equipment for the commodity sector (-) Evidence that considerable group of producers do not have the resources to use pesticides (-) Evidence of lack of knowledge on pesticides application (for specific commodity sector or comparable production system) (+) National or sectoral numbers on pesticide application (+ or -)

2.4.7 Insufficient remuneration



Definition With insufficient remuneration we refer to low wages for agricultural workers and low incomes for farmers. Minimum wages have been defined by the ILO as ‘the minimum amount of remuneration that an employer is required to pay wage earners for the work performed during a given period, which cannot be reduced by collective agreement or an individual contract’ (ILO, 1970).^{xxiii} The definition refers to the binding nature of a minimum wage. The purpose of a minimum wage is to protect workers against disproportionate low wages. In many countries however agricultural

workers earn less than the minimum wage or when they earn a minimum wage this is by far not enough to reach a living wage, i.e. the minimum income necessary for a worker to achieve a decent standard of living. For insufficient remuneration we therefore focus on the latter: incomes or wages sufficient for a decent standard of living.

National indicator for calculation of commodity-specific national risk score

For insufficient remuneration we use a different approach compared to the other themes, due to the amount of data that is available and the calculations that can be made with them. The final indicator that we calculate is the *living income deficit*. What we mean by this will be explained in the next paragraph. We first

distinguish between the two key elements needed to calculate a living income gap. To get an indication of insufficient remuneration we estimate the living income gap, which is the difference between actual incomes earned and a minimum income that should be earned (the benchmark).

1. **Income benchmark:** In order to assure that incomes that are earned actually meet the local requirements of a decent standard of living, we use living incomes/living wages as a benchmark. This includes enough money to cover a healthy diet, decent housing, other essential needs such as healthcare and schooling, as well as extra funds to cover unexpected events. Anker & Anker have developed a very detailed methodology for setting living wage/living income benchmarks across different geographies. An alternative methodology is the one of the WageIndicator Foundation, which use another approach towards setting these benchmarks, which may be less accurate, but also much more scalable. For this last reason we have decided to use these benchmarks, as we are trying to cover as many countries and sectors across the world. We considered using benchmarks following the Anker and Anker methodology where available, and else using Wage Indicator benchmarks, but we learned that this caused bias in the final outcomes depending on the source used, making the final outcomes not comparable across countries (see Appendix 4).
2. **Incomes:** a frequently used source for income is a countries' GDP, but this does not always reflect the reality of people living within a country very well, as it only focuses on the value of goods and services produced. It is therefore better to use survey data on household incomes. This data is available for most countries through, for example, national household surveys. As combining all of this data is very time-intensive, we use the World Bank 'survey mean consumption or income per capita,' which combines survey data on incomes or expenditures from different sources.

Calculating the area of the living income gap

As we want to measure not only the prevalence of the living income gap (e.g. '30% of the people earn less than the living income benchmark'), but also the severity of the living income gap, we use the Lorenz curve, which measures the distribution of income/wealth, to calculate what we refer to as the *living income deficit*. On it's Poverty and Inequality Platform, the World Bank publishes the survey mean consumption or income per capita, fitted to a Lorenz distribution.⁷⁰ For each income percentile, it presents the average daily per person income or consumption. For each percentile, we calculate the difference between this income/consumption value and the living income benchmark. The sum of all of these differences is divided by the living income benchmark * 100, to get to the 'area' of the living income gap indicated in **Figure 3** below. The final score is a score between 0 and 1 showing the red 'area' as opposed to the green 'area'. Note that this is not the actual area, as it is in fact the sum of each percentile, but we refer to it as such.

$$LI\ deficit = \frac{\sum LI\ benchmark - Income}{LI\ benchmark * 100}$$

⁷⁰ <https://datacatalog.worldbank.org/search/dataset/0063646/-Poverty-and-Inequality-Platform--PIP---Percentiles>

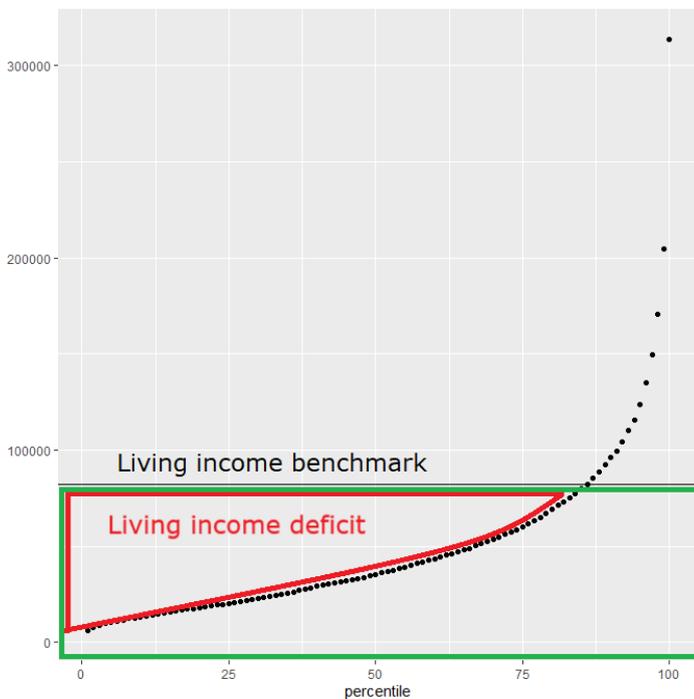


Figure 3 The living income deficit

We have made some further adjustments to the data to make sure that they reflect the realities of crop producing households better.

- Upon inspecting data points of countries for which we had both income as well as consumption data, we found that, on average, incomes were 4.5% higher than consumption. To correct for this, we multiplied all consumption data by 1.045. This does not take into account any between-country differences that exist in savings, but we did not have any other data to correct for this.
- All data was corrected for inflation to make sure that price levels of the income data match the price levels of the benchmarks.
- For both the benchmarks from the WageIndicator, as well as for the World Bank data we took rural data if available, and else national level data. We never use urban data only.
- The WageIndicator is available at subnational levels, allowing us to make a crop-specific national living income deficit, if we would also have income data available at subnational levels. We do not have subnational estimates of income, but the Global Data Lab, does have subnational predictions of the International Wealth Index.⁷¹ Similarly to what we did for subnational adjustments in other human rights themes, for each subnational region we calculated the deviation from the median wealth index of that country, and used these deviations to adjust the national (or rural) level income/consumption values. The Global Data Lab also has subnational estimations for the Gini coefficient for wealth inequality, for which we use in a similar approach to adjust the income estimations per percentile to subnational levels. For both of these indicators we cap adjustments from the national median at 0.5 and 2. For Colombia and Brazil, the GDL gini-coefficient is very low whereas the WB gini-coefficient is not. This causes issues when multiplying with the deviation from the mean. We therefore do not correct for subnational inequality for these two countries.
- Following the approach we used for the other themes, based on spatial crop production patterns from MapSPAM⁷² we then use the harvested areas for each crop, aggregated to the highest sub-national disaggregation levels (ADM1, e.g. provinces) to calculate the share of the national production of each crop produced in a specific region. These shares are used as weights to calculate a crop-specific weighted national living income deficit. In case we do not have subnational estimates of the International Wealth Index, we simply use the national level income/consumption values and the national level benchmark from Wage Indicator.

⁷¹ <https://globaldatalab.org/iwi/>

⁷² <https://mapspam.info/>

Benchmarking of the living income deficit used for calculation of the national risk score in step 4

The benchmarks for the area of the living income gap were based on the distributions within the data. These will be revised upon adding more countries to our dataset.

Living income deficit	Benchmark
0	0
0-0.05	1
0.05-0.2	2
0.2-0.3	3
0.3-0.4	4
> 0.4	5

Standardised set of questions to assess the risk of insufficient remuneration for calculation of commodity risk score

The concepts of 'living wage' and 'living income' are both about achieving a decent standard of living for households. Elements of a decent standard of living include: food, water, housing, education, healthcare, transport, clothing, and other essential needs including provision for unexpected events. The difference between living wage and living income is that the living wage is applied in the context of hired workers (in factories, on farms, etc.), whereas living income is discussed in the context of any income earner, such as self-employed farmers. (from Global Living Wage & LICOP).

For the theme of insufficient remuneration, the suggested approach for assessing the presence of the risk in production of a given commodity in a given country differs from other themes as the national risk score already approaches the sectoral risk to an important degree (for more information see earlier sections of this chapter). As such no commodity risk score needs to be calculated. However, we ask the researcher to provide a short thematic summary with workforce characteristics, combined with information collected for the theme of 'freedom of association and collective bargaining' can be made available to a risk score user for further validation and substantiation of the risk score.

2.4.8 Access to land and material resources

Access to land and material resources

Definition Secure access to land and material resources (e.g. water, forests, infrastructure) are fundamental human rights for individuals and groups of peoples to secure livelihoods, housing or shelter, and poverty reduction. The right of access to land is defined as: '*The ability to use land and other natural [and material] resources, to control the resources and to transfer the land rights to the land to take advantage of other opportunities*' (FAO, 2006).^{xxiv} Access impacts how individuals or groups of peoples can own, use, develop and control land and other material resources. Material

resources can be natural (e.g. water, forest land and home lands) and man-made (e.g. infrastructure, sanitation facilities, schools). In no case a people may be arbitrarily deprived of its property (incl. land, forest and waters) or its own means of subsistence. Expanding operations may cause depletion of and conflict over access to land and material resources. Especially when land ownership or land usage agreements are informal or contested. In the case of Indigenous Peoples the right of Free, Prior and Informed Consent (FPIC) is formalised in the UN Declaration on the Rights of Indigenous Peoples (UNDRIP). The violations of the rights of Indigenous Peoples are of a particular concern within this theme as well as other minority groups that face a specific vulnerable position to the violation of access to land and material resources.

National indicators for calculating the national risk score in step 1 of the human rights risk assessment methodology

Since this theme was redefined from the indigenous people's rights to access to land to account for wider community risks, we had to look for additional and new data to have a relevant sector indicators as per the

new theme definition. The initial exploration of potential indicators started with a wide range of databases. We were aiming to look at not only indigenous community rights but at access to land at large including indicators not only on strength of the legal framework but enforcement and practices as well. We have come across these databases: indicators in the FAOSTAT Land Use database related to soil, water and air quality as a result of agricultural production⁷³ and Gender and Land Rights database,⁷⁴ datapoints in the Voluntary Guidelines on the Responsible Governance of Tenure of Land Fisheries and Forests in the Context of National Food Security (VGGTs),⁷⁵ which includes an index value on the extent, to which the national laws fare against international standards on expropriation, compensation and resettlement. Other databases explored were the OECD Social Institution and Gender Index (SIGI),⁷⁶ more specifically indicators related to equal access to land assets secured by law between men and women and existence of discriminatory practices or laws that discriminate women's legal rights to own and use their land. Other database that could proxy law enforcement and respect for land rights is the PRINDEX database that looks at perceptions on tenure security. We have also considered data on forest tenure provided by the Rights and Resource Initiative (RRI).⁷⁷ Lastly, we looked at the data provided by the LandMark⁷⁸ that aggregates information on share of indigenous and communal lands, level of official recognition of these lands and strength of legal security. We were not able to identify any indicators with sufficient scope to assess issues such as instances of land conflicts or land grabbing.

To have a good mix of indicators, we wanted to arrive at a set of direct and severity indicators, ideally capturing legislative framework, enforcement and accounting for risk increasing factors. After initial assessment, we have excluded FAOSTAT, VGGTs and RRI indicators due to limited number of observations. We have proceeded with statically testing the different variables from the remaining three databases (OECD, PRINDEX and LandMark). Given that the SIGI database predominantly assesses gender differences, which is accounted for as a source of discrimination, we did not want for this indicator to have a substantial weight in the final risk score. However, we wanted to keep it as it is the only indicator accounting for potential legal discrimination related to access to land. Women make a substantial part of the workforce in the agricultural sector and their land rights are more likely to face discriminatory practices related to land use and access to land. After running multiple tests, PRINDEX indicators, both perception on tenure security and insecurity, were measuring an opposite pole of our underlying concept and had to be excluded. We assume that this is due to PRINDEX being perception based and sampling bias that potentially influenced the final results. PRINDEX, however, includes three other indicators that are not perceptions per se but include responses on whether a respondent has (or does not have) a formal document guaranteeing full access to and use of their properties. Testing this indicator together with the LandMark indicators, we found three indicators that statistically load onto the same factor, and we were able to reasonably explain the weight assigned to each of these indicators:

1. The first indicator is the percentage of country held by indigenous peoples & communities acknowledged by the government. This indicator is calculated based on two variables provided by the LandMark portal—area held by indigenous peoples & communities formally acknowledged by the government out of total area held by indigenous peoples & communities per country. We arrive at a percentage, where we assume that the lower the share of land formally acknowledge, the higher the risk of not having rights for ownership and full use of the indigenous groups and local communities over their land.
2. Second indicators is the percentage of people not having any documents demonstrating their right to live or use any of their properties. It is one of the PRINDEX indicators assessing whether respondents have access to formal documentation, informal documentation or have no documentation.
3. The last indicator used looks at whether there are any 'customary, religious or traditional practices or laws that discriminate against women's legal rights regarding land to own, use, make decisions and use as collateral' (Ferrant, Fuiet & Zambrano, 2020). The aim is to capture any legal (or other) practices that disable women from fully exercising their land rights. This data is collected as part of the OECD's Social Institutions and Gender Index (SIGI). The index was launched in 2009 and is updated every 2-5 years.

⁷³ <https://www.fao.org/faostat/en/#data/RL>

⁷⁴ <https://www.fao.org/gender/en>

⁷⁵ <https://www.fao.org/3/i2801e/i2801e.pdf>

⁷⁶ <https://www.oecd.org/stories/gender/social-norms-and-gender-discrimination/sigi>

⁷⁷ <https://rightsandresources.org/rri-tenure-tool/>

⁷⁸ <https://www.landmarkmap.org/data/>

Benchmarking of national indicators used for calculation of national risk score in step 1 of the human rights risk assessment methodology

To benchmark the percentage of a country held by indigenous peoples and communities acknowledged by the government, we did not look into regional trends but simply assumed that all land held by communities that is formally acknowledged implies the lowest risk and vice versa. This decision follows empirical evidence that shows that formal recognition and land formalisation of indigenous and community lands improves land rights, therefore protects communities from land dispossession in face of increasing land pressures, and contributes to environmental outcomes, such as forest conservation and improvement of biodiversity (Fa et al., 2020; Notess et al., 2021). In case of the percentage of people not having any formal documentation, we assessed the distribution of the data, looking at countries that are known frontrunners in terms of land rights and the opposite cases. We have also cross-checked with the perceptions on tenure security to arrive at the final division. In case of practices related to access to land assets (SIGI indicator), we have taken the levels of the indicator to match our risk scores.⁷⁹

Table 23 Access to land and material resources: national level indicator values and corresponding benchmarks

Indicator	Indicator type	Indicator value	Benchmark
Percentage of country held by indigenous peoples & communities acknowledged by government (LandMark) ⁸⁰	Legal framework indicator	=100%	0
		100-75%	1
		75-50%	2
		50-25%	3
		25-1%	4
		=0%	5
Percentage of people not having any documents demonstrating their right to live or use their property (PRINDEX) ⁸¹	Severity indicator	=0%	0
		0-10%	1
		10-20%	2
		20-35%	3
		35-55%	4
		>=55%	5
Secure access to land assets-Practice (SIGI)	Severity indicator	=0	0
		0-0.25	1
		0.25-0.5	2
		0.5-0.75	3
		0.75-1	4
		=1	5

National indicator weights used in calculation of national risk score in step 1 of the human rights risk assessment methodology retrieved from the factor analysis

As mentioned earlier, we have excluded two PRINDEX variables – tenure security and tenure insecurity due to negative factor loadings. Initially, we have also included strength of legal security indicator from the LandMark portal. During the factor analysis, it appeared that this indicator was loading onto another latent variable. This means that it was not strongly related to the other indicators. When running the factor analysis on the three remaining indicators, we arrived at an explainable distribution of weights relevant to the risk theme in question. The final weights used are:

⁷⁹ The explanation of the levels can be found here <https://www.oecd-ilibrary.org/docserver/022d5e7b-en.pdf?expires=1711619565&id=id&accname=guest&checksum=9E54DA8CBC781520FF32DA8C4986DAD0>

⁸⁰ https://www.landmarkmap.org/map/#x=-102.46&y=13.47&l=3&a=community_FormalDoc%2Ccommunity_NoDoc%2Ccommunity_FormalClaim%2Ccommunity_Occupied%2Cindigenous_FormalDoc%2Cindigenous_NoDoc%2Cindigenous_FormalClaim%2Cindigenous_Occupied

⁸¹ <https://www.prindex.net/data/>

Table 24 Access to land and material resources: national level indicator weights

Indicator	Weight
Percentage of country held by indigenous peoples & communities acknowledged by government	49%
Percentage of people not having any documents demonstrating their right to live or use their property	48%
Secure access to land assets-Practice	3%

Standardised literature review conducted for the purpose of the commodity risk score assessment in step 4 of the human rights risk assessment methodology

The following section outlines the standardised list of questions that informs the literature study the risk of reduced access to land and material resources in the production of a specific commodity within a particular country. Since the theme is focused on *access*, it can but does not need to be, the right of vulnerable groups as such as minorities or indigenous peoples. This theme may include a violation of rights of the producers themselves when different commodity sectors compete over the same lands or resources. This theme is clearly different from the assessment of a violation of the risk at the level of an individual caused by (national) discriminative practices or policies (e.g. women’s access to land by patriarchal relationships), nor does it cover the right to a ‘safe and healthy environment’ that would assess the effect of a commodity sector on the quality of its surrounding land and resources. Only when environmental degradation would be so severe that it influences access to land (and material resource) as means of substance it would become part of this theme.

Standardised set of questions

The researcher builds upon the information in the commodity-production database to answer the following question: *is there (sufficient, reliable, direct or indirect) qualitative information for the risk at production level (commodity, agricultural sector, nation)?* Appendix 2 provides detailed information on reliability criteria of literature sources

1. Start with a simple online search for **direct and reliable information** linking the commodity AND country AND theme (max. 10 minutes, using: google, google Scholar, Scopus and web of science). In order to verify whether there is direct and reliable evidence linking the risk theme to the commodity and country.
 - a. yes (min. of 2 sources, see [reliability criteria](#)) → go to ‘benchmarking table’ (risk level: 4.5 or 5). *Based on the criteria in the benchmarking table the researcher might want to look for additional reliable sources on specific ‘assessment criteria’ to be able to establish the risk level.*
 - b. no → proceed to question 2.

Suggested each terms for access to land and (material) resources: land rights, access to land, land conflict, land grab, conflict, resources, access to [resources such as drinking water], indigenous peoples, FPIC, minority groups, illegal farming, contested lands.

Environmental degradation would only become part of the analysis when it directly affects a community’s access to land and material resources (as a right and a means of substance).

2. Based on information on the [country]’s production systems and the commodity’s localities of production, is there **indirect evidence** that links these localities of production, the theme and the agricultural sector in the country? (max. 15 minutes, using: google, google Scholar, Scopus and web of science). *Look for at least 2 reliable literature sources that can assess this question. See also: [reliability criteria](#).*

Supporting questions:

- a. Is the wider agricultural sector associated with the [theme] in the [country]?
- b. Do these examples share similar characteristics with the [commodity] sector?
 - i. Where are the localities of production?
 - ii. What are the commodity’s production systems?
 - iii. Who are the people that live in proximity of the production localities?
 - iv. Are these considered to be vulnerable groups*?
 - v. Are there systemic land use or land rights issues in the production country (search for more context on land rights issues in the country related to the sector)?

Yes → go to ‘benchmarking table’ (risk level 3, 3.5 or 4)

No → Two reliable sources *do indicate* that a violation of access to land and (material) resources is not associated with the agricultural sector → go to ‘benchmarking’ (risk level: < 3)

UNKNOWN □ There are *no sources available* on the risk of violation of access to land and (material) resources in the agricultural sector. No meaningful assessment possible. Please note that this situation is least desirable. In most cases the researcher is able to build upon information in the commodity production database, information sources that are used to assess other risk themes and sometimes information that has been used to assess other commodity sectors in the same focus country. By combining this information a meaningful assessment of this theme can still be possible and a score can be assigned. It might that this information will only become available when engaging in inter- and intra country cross-check

* By **vulnerable groups we mean:** women, youth, migrants, seasonal workers, religious groups, minority groups (incl. ethnic groups and LGBTIQ+) or indigenous peoples. In this theme we have a particular focus on indigenous peoples and (ethnic or religious) minority groups.

Suggested source on Indigenous Peoples per country: <https://www.iwgia.org/en/> (medium reliability)

The researcher will record the information derived from the literature review, guided by the questions above, in a stand-alone thematic conclusion that is recorded in an excel file.

Standardised set of assessment criteria

The researcher builds upon the 'stand-alone thematic conclusion' and the commodity-production database and consults a table with assessment criteria ('benchmarking table') to match the thematic conclusions with specified risk level. It can be that the researcher needs to consult some additional sources to determine the right risk level or make an informed judgement on the risk level when the descriptions of the risk level characteristics do not match the specific case. In the latter situation, a justification of choice between two risk levels is made explicit in the thematic descriptions and verified by the second reviewer. The table below provides the standardised set of assessment criteria for the theme of access to land and material resources.

Table 25 *Assessment criteria for access to land and material resources literature study conclusions*

Risk Level	Characteristics
0	-
0.5	
1	<p>Very low risk</p> <p>Access to land and material resources (of those peoples living in the proximity of the commodity's production localities) is very unlikely to be contested. There is direct evidence that access to land and material resources is respected in the production of the commodity.</p> <p>National risk score is < 1.5</p> <p>Additional criteria that can help assessing this theme:</p> <ul style="list-style-type: none"> • high % people that have formal legally binding documents for their right to live in or use any of their properties (prindex.net)
1.5	<p>Access to land and material resources (of those peoples living in the proximity of the commodity's production localities) is very unlikely to be contested. There is direct evidence that access to land and material resources is respected in the production of the commodity and/or there is no direct evidence for the violation of [theme] in the country.</p> <p>National risk score is < 2.0</p> <p>Additional criteria that can help assessing this theme:</p> <ul style="list-style-type: none"> • Medium - high % people that have formal legally binding documents for their right to live in or use any of their properties (prindex.net)
2	<p>Low risk</p> <p>Access to land and material resources (of those peoples living in the proximity of the commodity's production localities) is unlikely to be contested. There is no direct evidence for the violation of [theme] in the agricultural sector.</p> <p>National risk score is < 2.5</p> <p>Additional criteria that can help assessing this theme:</p> <ul style="list-style-type: none"> • Medium - high % people that have formal legally binding documents for their right to live in or use any of their properties (prindex.net)

Risk Level	Characteristics
2.5	<p>Access to land and material resources (of those peoples living in the proximity of the commodity's production localities) is unlikely to be contested. There is no direct evidence for the violation of [theme] in the agricultural sector.</p> <p>There are only a small number of vulnerable groups living in the proximity of production localities.</p> <p>National risk score is < 3.5</p> <p>Additional criteria that can help assessing this theme:</p> <ul style="list-style-type: none"> • Medium - high % people that have formal legally binding documents for their right to live in or use any of their properties (prindex.net)
3	<p>Medium risk ('a risk')</p> <p>Access to land and material resources (of those peoples living in the proximity of the commodity's production localities) is unlikely to be contested.</p> <p>There is no direct evidence for the theme in the commodity sector. There is limited evidence for the theme in the agricultural sector. The evidence that there is seems to suggest that these examples are not related to systemic/structural issues OR does not share similarities with the production system of the commodity.</p> <p>However, the limited evidence that there is share some (but minimal) similarities with the commodity sector in terms of:</p> <ul style="list-style-type: none"> • Production localities • Production systems • Presence of vulnerable groups living in the proximity of production localities. <p>Additional criteria that can help assessing this theme:</p> <ul style="list-style-type: none"> • Medium - Low % people that have formal legally binding documents for their right to live in or use any of their properties (prindex.net)
3.5	<p><i>Access to land and material resources (of those peoples living in the proximity of the commodity's production localities) is likely to be contested.</i> The assessment of this theme relies on indirect evidence: there is evidence that the violation of access to land and/or material resources is a problem in the wider agricultural sector but there is no direct evidence of the commodity sector.</p> <p>One of these different supporting criteria:</p> <ul style="list-style-type: none"> • National situation regarding secure access to land is likely to affect the commodity sector, e.g.: <ul style="list-style-type: none"> ◦ broader national situation of land tenure arrangements • Sectoral problems are likely to affect the commodity sector, e.g: <ul style="list-style-type: none"> ◦ specific competing claims, including historic claims ◦ Regions of production of the commodity overlap with regions where access to land/resources is an issue. ◦ The production system of the commodity shares similarities with the production systems of those commodities that have land rights issues. ◦ Vulnerable groups live in the proximity of production localities ◦ Moderate or weak enforcement of land rights in the country <p>Note: no direct evidence for the theme in the production of the commodity (or not reliable)</p> <p>Additional criteria that can help assessing this theme:</p> <ul style="list-style-type: none"> • Medium - Low % people that have formal legally binding documents for their right to live in or use any of their properties (prindex.net) • commodity risk score for discrimination is medium – high
4	<p>High risk ('high chance')</p> <p>Access to land and material resources of those peoples living in the proximity of the commodity's production localities is likely to be contested. The assessment of this theme relies on indirect evidence: there is evidence that the violation of access to land and/or material resources is a problem in the wider agricultural sector but there is not sufficient (or no) direct evidence of the commodity sector.</p> <p>At least two of these different supporting criteria can be applied:</p> <ul style="list-style-type: none"> • National situation regarding secure access to land is likely to affect the commodity sector, e.g.: <ul style="list-style-type: none"> ◦ broader national situation of land tenure arrangements • Sectoral problems are likely to affect the commodity sector, e.g: <ul style="list-style-type: none"> ◦ specific competing claims, including historic claims ◦ Regions of production of the commodity overlap with regions where access to land/resources is an issue. ◦ The production system of the commodity shares similarities with the production systems of those commodities that have land rights issues. ◦ Vulnerable groups live in the proximity of production localities ◦ weak enforcement of land rights in the country

Risk Level	Characteristics
	<p>Note: there can be direct evidence for the risk of violation of access to land and/or material resources in relation to the commodity but the evidence is either not sufficient or seems to be mere incidental.</p> <p>Additional criteria that can help assessing this theme:</p> <ul style="list-style-type: none"> • Low % people that have formal legally binding documents for their right to live in or use any of their properties (prindex.net) • commodity risk score for discrimination is medium – high
4.5	<p>There is sufficient direct evidence* that the violation of access to land and/or material resources is a problem in the production of the specific commodity in the focus country. These sources seem to suggest that the violation of these rights are not to be regarded as single incidents and might be related to structural or systemic problems at national or regional level (medium likelihood).</p> <p>Additional criteria that can help assessing this theme:</p> <ul style="list-style-type: none"> • National situation regarding secure access to land is likely to affect the commodity sector, e.g.: <ul style="list-style-type: none"> ○ Broader national situation of land tenure arrangements • Sectoral problems are likely to affect the commodity sector, e.g: <ul style="list-style-type: none"> ○ Specific competing claims, including historic claims ○ Vulnerable groups live in the proximity of production localities ○ Supporting evidence for the theme for the agricultural sector as a whole (affirms likelihood) ○ Weak enforcement of land rights or the absence of formal land rights ○ Low % people that have formal legally binding documents for their right to live in or use any of their properties (prindex.net)
5	<p>Very high risk ('very likely')</p> <p>There is sufficient direct evidence* that the violation of access to land and/or material resources is a problem in the production of the specific commodity in the focus country. These sources seem to suggest that the violation of these rights are not mere incidents but can be related to structural or systemic problems at a national or region level (medium - high likelihood).</p> <p>Additional criteria that can help assessing this theme:</p> <ul style="list-style-type: none"> • National situation regarding secure access to land is likely to affect the commodity sector, e.g.: <ul style="list-style-type: none"> ○ Broader national situation of land tenure arrangements • Sectoral problems are likely to affect the commodity sector, e.g: <ul style="list-style-type: none"> ○ Specific competing claims, including historic claims ○ Vulnerable groups live in the proximity of production localities ○ Supporting evidence for the theme for the agricultural sector as a whole (affirms likelihood) ○ weak enforcement of land rights or the absence of formal land rights ○ Low % people that have formal legally binding documents for their right to live in or use any of their properties (prindex.net)

3 Environmental risks assessment methodology

The environmental risks in the dashboard can be defined as the potential adverse impacts on the environment resulting from the agricultural production of a commodity. In this project we use both Life Cycle Assessment (LCA) and spatial approaches to assess the environmental risks for the selected commodities.

We rely on the Life Cycle Assessment (LCA) because it quantifies environmental impact throughout the entire life cycle of a product in a standardised and commonly accepted way. LCA is rooted in natural sciences and considers multiple environmental impacts, that allows the user to get a more integrated approach towards sustainability issues at national level. The spatial approach allows users to get more insights in where specific risks appear at sub-national levels. This level of spatial detail is crucial for identifying patterns and addressing challenges more effectively. However, achievable granularity depends on the availability and quality of spatial crop production data, as well as related thematic datasets. For this project, we rely on existing datasets and sources with global coverage, which may result in overlooking potentially higher-quality datasets that are available only for specific regions or countries (see Appendix 7). While these global datasets provide broad applicability, they may not fully capture regional variations or the most accurate data available for particular themes.

The dashboard covers the environmental risks shown in Table 25. This table also shows whether the environmental risks are calculated by means of LCA and/or spatial approaches. For water use/water stress a combined approach is used, where national level scores in the dashboard present the LCA scores for water use, and where the subnational level scores present the spatial scores for water stress.

Table 26 Assessment (LCA and/or spatial) per environmental theme

Environmental topic	LCA	Spatial	Section for theme-specific information
Acidification	X		3.1.3
Biodiversity loss		X	3.3
Climate change, total	X		3.1.3
Climate change, fossil			
Climate change, biogenic			
Climate change, land use and land use change			
Climate change, peat oxidation			
Deforestation		X	3.3
Eutrophication	X		3.1.3
Marine eutrophication			
Freshwater eutrophication			
Freshwater ecotoxicity	X		3.1.3
Water stress		X	3.3
Water use	X		

3.1 Life Cycle Assessment (LCA)

3.1.1 General approach: steps and scoring

High-level overview of steps & scores

LCA is a standardised methodology to evaluate the environmental impact of a product. LCA is a quantitative approach rooted in natural science, that covers a wide array of indicators to identify potential trade-offs between different environmental issues. The LCA approach is divided into four steps (ISO 14044, 2006) (see also Figure 4):

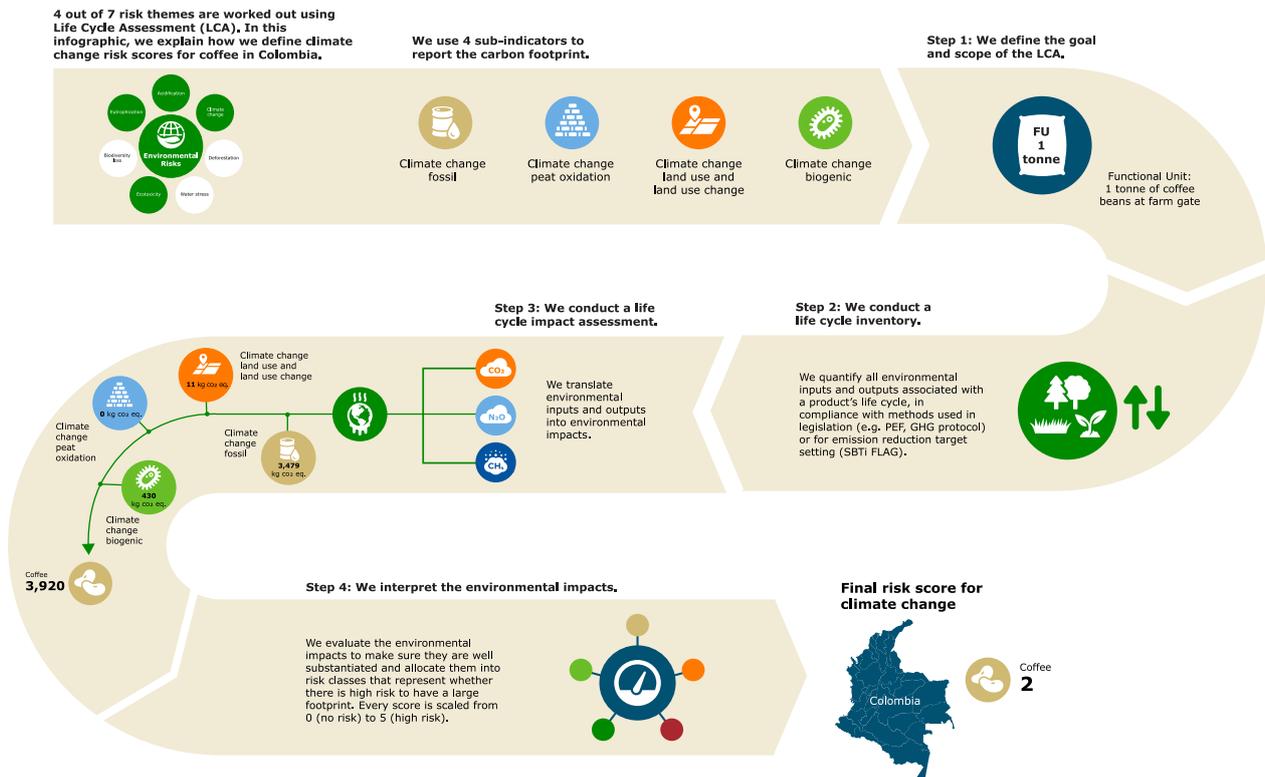


Figure 4 Environmental risk assessment methodology

Step 1: Goal and Scope Definition

In this step, the scope, system boundary, functional unit and objectives of the LCA are defined. The functional unit quantifies the performance of the product under study and serves as a reference unit. The methodology does not account for market mixes of raw materials; environmental impacts are solely based on domestic production, ignoring trade flows. System boundaries outlines the life cycle stages and processes included in the analysis, excluding those beyond the cut-off rule.

Step 2: Life Cycle Inventory (LCI)

This step involves the collection and quantification of data on the inputs, outputs, and emissions associated with the product being evaluated.

Step 3: Life Cycle Impact Assessment (LCIA)

This step evaluates the potential environmental impacts of inputs and outputs (e.g. emissions, waste) gathered in the LCI phase. Environmental impacts are classified into environmental themes, so called 'impact categories.' Each environmental impact category has its own characterisation model (e.g. IPCC 2021 for climate change). This selection aligns with the goal and scope and comprehensively addresses urgent environmental issues in agri-commodity value chains.

Step 4: Interpretation

This step concludes the assessment by evaluating the conclusions and ensuring they are well-substantiated. Results are presented as characterised results per impact category (e.g. kg CO₂ eq. for climate change) and additionally translated into risk scores to facilitate risk identification and evaluation. Risk scores range from 1 (low risk) – 5 (high risk), with classes increasing exponentially. The risk scores is relative, and only allow for comparison of product-country combinations for intra-product category comparisons (i.e. soy with soy, and maize with maize).

3.1.2 Detailed methodology for calculating LCA-based risk scores per product country combination

The four main steps related to the national level scores using a LCA, as summarised in the general approach, are explained in more detail in the following sections.

Step 1: Goal and scope definition

Functional unit

The functional unit (FU) is the quantified performance of a product or system, to be used as a reference unit. The functional unit is quantitatively defined by describing the function provided by the product (i.e. how much). The reference flow is the amount of products needed to provide the defined function. All other input and output flows in the analysis quantitatively related to it.

The functional unit as adapted in this methodology is:

1 tonne of product at farm (for raw materials)

It is recognised that feed and food products might fulfil multiple functions (e.g., basic energy supply, nutrient supply), which makes it more difficult to define the functional unit. Defining a functional unit based on the nutritional content might be possibly better reflect the primary functionality of feed and food products. However, every product has its own nutritional profile and there is no consensus how to account for this in life cycle assessment. Furthermore, not all of the products are consumable (e.g. cotton) or are consumed by humans (e.g. intermediate products such as soy as feed for food producing animals). Also, a material-based approach in mass as applied in this methodology, allows the user the flexibility to convert the functional unit into another functional unit, depending on the use.

System boundaries

The system boundary defines which parts of the product life cycle and which associated life cycles stages and processes belong to the analysed system (i.e. are required for carrying out its function as defined by the FU), except for those processes excluded based on the cut-off rule. This methodology adopts the cradle-to-farm including all activities related to the cultivation and production of crops This is consistent with the defined functional unit.

Step 2: Life Cycle Inventory Modelling

The Life cycle Inventory was divided into seven sub-sections, referred to in this document as modules. For these 7 modules data was gathered and modelling methodologies were selected. Furthermore, background processes were selected from Agri-footprint 6.3. (Mérieux NutriSciences | Blonk, 2023) and ecoinvent 3.10 – allocation, cut-off by classification (ecoinvent, n.d.). Both databases use economic allocation by default, ensuring interoperability between the two databases. A more detailed description per module will be provided in this step, **Table 27** provides an overview.

Table 27 Overview of the modules that establish the Life Cycle Inventory

Module	Description
1 General	Yield, yield of co-products and allocation
2 Fertiliser	Production of fertiliser, emissions from fertiliser application and emissions from crop residues. Fertiliser includes both artificial fertiliser and organic fertiliser. This module also includes an extrapolation methodology to account for data gaps.
3 Energy	Energy use from on-farm machinery
4 Water	Blue water consumption and energy use of irrigation
5 Pesticides	Production of pesticides and emissions from pesticide application
6 Land use & Land Use Change	Accounts for land use impacts, carbon uptakes and emissions originating from land occupation and land use changes
7 Other	Methane emissions from rice cultivation, additional comment about carbon dioxide emissions from peat oxidation

Module 1: General

M1.1 Yield

Yield is based on FAO statistics (Food and Agriculture Organization of the United Nations, n.d.-a), using a three year average (2020-2022). The three year average is selected to level out differences in yields related in growing conditions over the years such as weather and pests.

M1.2 Yield of co-products

The yield of co-products and allocation between the main and co-product was calculated in line with the methodology from Agri-Footprint (Mérieux NutriSciences | Blonk, 2023). In Agri-footprint removal rates were retrieved from literature and the economic value from price trends in the United Kingdom. See **Fout! Verwijzingsbron niet gevonden.** for an overview of the data. This data was also used for the calculations done in this project.

The Above Ground Dry Matter (AGDM) was calculated with the IPCC 2019 tier 1 approach, which the yield of the co-products was based on. Only a fraction of the AGDM can be harvested as a co-product, which substantially differs globally. For this reason Agri-Footprint (2023) uses maximum removal rates, which have also been adopted in this methodology.

Table 28 Economic value of the product, co-product and removal rates in Agrifootprint (Mérieux NutriSciences | Blonk, 2023)

Main-product	Economic value main product (€/kg)	Co-product	Economic value co-product (€/kg)	Removal fraction
Maize	0.16	Maize, stover	0.06	15.0%
Rice	0.16	Rice, straw	0.06	33.5%
Soya bean	0.30	Soya bean, straw	0.05	10.0%
Wheat, grain	0.16	Wheat, straw	0.06	33.5%

M1.3 Allocation

If a process or facility provides more than one function, i.e. it delivers several goods and/or services ('co-products'), it is 'multifunctional'. In these situations, all inputs and emissions linked to the process shall be portioned between the product of interest and the other co-products in a principled manner.

The following decision hierarchy as described in the ISO 14044:2006 is followed:

1. Whenever possible, allocation should be avoided by:
 - a. Dividing the unit process to be allocated into two or more sub-processes and collecting the input and output data related to these sub-processes (i.e., sub-division),
 - b. or expanding the product system to include the additional functions related to the co-products (i.e., system expansion).

2. Where allocation cannot be avoided, the inputs and outputs of the system should be portioned between its different products or functions in a way that reflects the underlying physical relationships between them; i.e., they should reflect the way in which the inputs and outputs are changed by quantitative changes in the products or functions delivered in by the system.
3. Where physical relationship alone cannot be established or used as the basis or allocation, the inputs should be allocated between the products and functions in a way that reflects other relationships between them. For example, input and output data might be allocated between co-products in proportion to the economic value of the products.

Furthermore, ISO 14044:2006 (ISO, 2006) states that allocation procedures shall be uniformly applied to similar inputs and outputs of the system under consideration. To enable valid comparisons between commodities in different categories, the allocation approach of similar situations in other categories are be harmonised wherever feasible

Module 2: Fertiliser

M2.1 Fertiliser production

To estimate the fertiliser production the amount of artificial fertiliser applied per hectare per crop per country per type of fertiliser was needed as an input, as well as the amount of organic fertiliser (manure) applied per hectare. A default transport distance for manure of 30 km was included in accordance with different methodologies and standards (FreshProduce PEFCR (draft, Weststrate et al., 2024), Agri-Footprint). As no specific data was available, a scaling mechanism was used to estimate the artificial fertiliser application. Every crop has a nutrient demand, which was retrieved from Ludemann et al. (2022), see **Fout!**
Verwijzingsbron niet gevonden..

Table 29 Data used as input for scaling procedure

Parameter	Data	Source
F_c	Fertiliser consumption per country X for the years 2019-2021 per type of fertiliser F (in 1000 tonnes of N, P, K)	(IFASTAT, n.d.-a)
F_N	Nutrient content per type of fertiliser F (fraction of N, P, K in fertiliser F)	(IFASTAT, n.d.-b)
F_D	Nutrient N, P, K demand by crop C for country X per hectare (in kilograms of nutrient per hectare)	(Ludemann et al., 2022)
F_M	Nutrient N in manure applied for country X, 3 year average 2020-2022 (in kilograms)	(Food and Agriculture Organization of the United Nations, n.d.-c)
F_A	Area of cropland in country X, 3 year average 2020-2022 (in 1000 hectares)	(Food and Agriculture Organization of the United Nations, n.d.-d)

It was assumed this nutrient demand is fulfilled in the first place by organic fertiliser (manure) application. To estimate how much organic fertiliser (manure) is applied, the kilograms of N from manure applied in a country was divided by the hectares of cropland in a country:

$$\text{Manure (kg N) applied per hectare} = \frac{F_M}{F_A}$$

It was assumed that the amount of manure applied per hectare in a country was equal to the amount of manure applied per hectare for a specific crop. The P and K application per hectare were scaled based on the ratio of N, P and K in different types of livestock manure as provided by NutriNorm (n.d.). The World Food Life Cycle Database (Quantis, n.d.) assumes 50% liquid manure and 50% solid manure application for laying hens, cattle and pig and 100% solid manure for the other livestock categories. Thereby the following assumptions were made, see **Table 30**:

Table 30 Assumption on the nutrient content of the type of manure applied. If a specific type of manure was not available, the manure of another livestock category was chosen to resemble the nutrient content

Name	Assumption
Buffalo manure	50% solid, 50% liquid cow manure
Camel manure	50% solid, 50% liquid cow manure
Sheep manure	100% solid sheep manure
Goat manure	100% solid goat manure
Horse manure	100% solid horse manure
Asses manure	100% solid horse manure
Mules and Hinnies manure	100% solid horse manure
Turkey manure	100% solid turkey manure
Duck manure	100% solid duck manure
Cow manure, dairy	50% solid, 50% liquid cow manure
Cow manure, other	50% solid, 50% liquid cow manure
Swine manure, market	50% solid, 50% liquid swine manure
Swine manure, breeding	50% solid, 50% liquid sow manure
Chicken manure, broiler	100% solid broiler chicken manure
Chicken manure, layer	50% solid laying hens manure belt, 50% liquid chicken manure
Lama manure	50% solid, 50% liquid cow manure

In no case more organic fertiliser (manure) is applied than the nutrient demand of the crop. If the organic fertiliser (manure) that is applied does not fully cover the nutrient demand of the crop, the remaining nutrients are covered by artificial fertiliser. The artificial fertiliser was scaled based on the national consumption, the nutrient content of the different types of fertiliser and the nutrient demand of the crop that was covered by artificial fertiliser. Data was a limiting factor in assessing the fertiliser usage more accurately. An overview of the data retrieved for the scaling procedure can be found in Table 29:

The calculation for the quantity of artificial fertiliser applied is:

$$\begin{aligned}
 \text{Fraction of fertilizer } F \text{ on country level} &= \frac{F_C}{\sum F_C} \\
 \text{Fertilizer type } F \text{ (kg)} &= \frac{\text{Fraction of fertilizer on country level} * (F_D - \text{Manure applied per hectare})}{F_N}, \text{ if } (F_D \\
 &\quad - \text{Manure applied per hectare}) < 0, \text{ Manure applied per hectare} = F_D
 \end{aligned}$$

The weight of the manure was calculated based on the manure nutrient composition as described by NutriNorm (n.d.) and the assumptions in **Table 30**. As manure is considered a residual product, a cut-off principle applied. Therefore, no upstream burdens were allocated to the production of the manure.

IFASTAT (n.d.-a,-b) provides data per fertiliser type on a nutrient level. Therefore, for NPK fertiliser multiple quantities were calculated based on N, P and K. The NPK the final amount of NPK fertiliser was calculated by:

$$NPK = NPK_N + NP_N + Other_N$$

For triple superphosphate the quantity was calculated by:

$$\text{Triple Superphosphate} = \text{Triple superphosphate}_{P_{205}} + \text{Other}_{P_{205}}$$

The calculated quantities were connected to the following background datasets from Agri-Footprint (Mérieux NutriSciences | Blonk, 2023):

- Ammonia, as 100% NH₃ (NPK 82-0-0), market mix, at regional storage {region specific suffix}
- Ammonium nitrate, as 100% (NH₄) (NO₃) (NPK 35-0-0), market mix, at regional storage {region specific suffix}

- Ammonium sulfate, as 100% $(\text{NH}_4)_2\text{SO}_4$ (NPK 21-0-0), market mix, at regional storage {region specific suffix}
- Calcium ammonium nitrate (CAN), (NPK 26.5-0-0), market mix, at regional storage {region specific suffix}
- Liquid urea-ammonium nitrate solution (NPK 30-0-0), market mix, at regional storage {region specific suffix}
- Urea, as 100% $\text{CO}(\text{NH}_2)_2$ (NPK 46.6-0-0), market mix, at regional storage {region specific suffix}
- Single superphosphate, as 35% $\text{Ca}(\text{H}_2\text{PO}_4)_2$ (NPK 0-21-0), at plant {RER}
- Triple superphosphate, as 80% $\text{Ca}(\text{H}_2\text{PO}_4)_2$ (NPK 0-48-0), at plant {RER}
- Potassium chloride (NPK 0-0-60), at plant {RER}
- Potassium sulphate (NPK 0-0-50) (Mannheim), at plant {RER}

M2.2 Extrapolation of fertiliser production

For certain crop country combinations data on the fertiliser usage was incomplete or missing. To still be able to generate a Life Cycle Inventory for these crop country combinations it was decided to adopt an extrapolation approach.

Extrapolation refers to the creation of new data points outside a set of known data points. In this context we apply geographical extrapolation: Life Cycle Inventory data of a certain crop in a certain region are adapted to the production of the same crop in another region (e.g. from the Netherlands to Germany).

The extrapolation approach is based on the work of Roches et al. (2010). The approach relies on a linear relationship between the environmental impact and a limited set of key farming inputs.

A detailed Life Cycle Inventory for a crop in a country is extrapolated to another (target) country by scaling the inputs. For scaling, estimators depending on the ratio of the yield and the farming intensities (agricultural indices) in the target and original countries are defined.

At least one inventory for the original country is needed. Inventories corresponding to special agricultural situations (e.g. extensive rainfall) should be avoided as original country. The term 'original' refers to the country or countries where Life Cycle Inventory data are already available and 'target' to the one for which Life Cycle Inventory data must be extrapolated. Countries representing a large share of the global production, are preferred. In this project the N, P and K applied from artificial fertiliser and the N, P applied from organic fertiliser (manure) were scaled based on data available for one of the other crop country combinations within the project. The options for original crop countries were therefore limited, which is recognised as a limitation of this project.

Nitrogen, Phosphorus and Potassium are physical farming inputs. They are used to convert the impacts per unit of farming input into the total impacts in the target country. We use estimators to approximate the missing farming inputs. We developed estimators based on agricultural indices. Agricultural indices indicate the farming intensity in a country and are dimensionless. Indices are country specific, but not crop specific.

We obtained agricultural indices for:

- Intensity of nitrogen fertilisation: kg of N fertilisers applied per ha in the whole country, normalised by the corresponding world weighted average
- Intensity of phosphorus fertilisation: kg of P fertilisers applied per ha in the whole country, normalised by the corresponding world weighted average
- Intensity of potassium fertilisation: kg of K fertilisers applied per ha in the whole country, normalised by the corresponding world weighted average

The area used for the agricultural indices issuing from FAOSTAT (Food and Agriculture Organization of the United Nations, n.d.-d) corresponds to the area occupied by cropland.

The estimators are based on the ratio of the yield in both the target country and the original country, in the ratio of the agricultural indices in both countries and on the amount of farming input in the original country.

The yield ration, i.e. the yield in the target country divided by the yield in the original country, explicitly occurs in the estimators for the modules: nitrogen, phosphorus, and potassium fertiliser use.

$$X_{c,t} = X_{c,o} * \frac{Y_{c,t}}{Y_{c,o}} * \sqrt{\frac{ind_{c,t}}{ind_{c,o}}}$$

- $X_{c,t}$ The amounts of farming inputs in the target country, for production of crop C
 $X_{c,o}$ The amounts of farming inputs in the original country, for production of crop C
 $Y_{c,t}$ The yield in the target country (kg raw product ha⁻¹)
 $Y_{c,o}$ The yield in the original country (kg raw product ha⁻¹)
 $ind_{c,t}$ The agricultural indices in the target country, i.e. representing the intensity of input use
 $ind_{c,o}$ The agricultural indices in the original country, i.e. representing the intensity of input use

The amount of fertiliser per fertiliser type was extrapolated directly by using the amount (in kilograms) per type of fertiliser as the X variable. The amount of nutrient was extrapolated as well by using the N, P and K (in kilograms) as the X variables, the outcome served as an input for the emission calculations.

Both the N, P, K from artificial fertiliser and the N, P from organic fertiliser (manure) were extrapolated based on this principle (only the N, P application was needed for the emission calculations in the case of organic fertiliser (manure)). The weight of the manure was calculated based on the calculated N from manure and the nutrient composition of the manure, as described by NutriNorm (n.d.), however no upstream burdens are allocated to the manure as it is considered a residual product.

M2.3 Emissions from fertiliser application

Emissions from Artificial fertiliser application, organic fertiliser (manure) application and crop residues were considered within this project and calculations rules were derived from IPCC methodologies and based on FloriPEFCR Broekema et al. (2024). Crop residues will be further explained in M2.4 Emissions from crop residues **Fout! Verwijzingsbron niet gevonden.. Table 31** provides an overview on the modelled emissions and their default methodologies.

Table 31 *Modelled emissions within this project and the underlying methodologies*

Emission	Compartment	Default modelling
Ammonia (NH ₃)	Air	IPCC Tier 1, 2019
Nitrogen oxides (NO _x)	Air	Default modelling for NH ₃ includes NO _x
Nitrate (NO ₃)	Water	IPCC Tier 1, 2019
Nitrous oxide (N ₂ O)	Air	IPCC Tier 1
Carbon dioxide (CO ₂)	Air	IPCC Tier 1

For the emission calculations a variety of parameters, constants and emission factors were used. An overview can be found in **Table 32**.

Table 32 Parameters, constants and emission factors used in the calculation of emissions from fertiliser (IPCC)

Parameter	Value	Description
N_{fert}		Total amount of N (kg) applied to soil as synthetic fertiliser
N_{org}		Total amount of N (kg) applied to soil as organic fertiliser (e.g. compost, animal manure)
$N_{applied}$		Total amount of N (kg) applied to soil as synthetic and organic fertiliser
	17/14	Conversion constant from NH_3 -N to NH_3
	46/14	Conversion constant from NO_x -N to NO_x
	62/14	Conversion constant from NO_3 -N to NO_3
	44/28	Conversion constant from N_2O -N to N_2O
	44/12	Conversion constant from CO_2 -C to CO_2
EF_{leach}	0.24	Fraction of added Nitrogen emitted as nitrate through leaching and runoff.
$EF_{directN_2O}$	0.01	Emission factor for direct N_2O emissions from Nitrogen inputs in kg N_2O -N per kg N
$EF_{Ammonia}$	0.01	Emission factor for N_2O emissions from atmospheric deposition of Nitrogen on soils and water surfaces in kg N_2O -N
EF_{lime}	0.12	Emission factor for limestone in kg C per kg limestone
EF_{urea}	0.2	Emission factor for urea in kg C per kg urea
$Frac_{vol}$	0.11	Fraction of N from synthetic fertiliser that volatilises as NH_3 and NO_x
$EF_{nitrate}$	0.011	Emission factor for N_2O emissions from Nitrogen leaching and runoff in kg N_2O -N per kg N leached and runoff
$Frac_{volo}$	0.21	Fraction of N from organic fertiliser (compost, animal manure, sewage sludge and other organic nitrogen) that volatilises as NH_3 and NO_x

For Artificial fertiliser application the following emissions were calculated, see **Table 33**:

Table 33 Type of emissions, calculation rules and selected elementary flows for Artificial fertiliser application

Emission	Calculation	Elementary flow
Ammonia emissions to air	$= Frac_{vol} * N \text{ applied from artificial fertilizer (kg N)} * (17/14)$	Ammonia, {Country suffix}
CO_2 emissions from limestone to air	$= 400 * EF_{lime} * (44/12)$ A default of 400 kg of limestone was assumed for every crop. This based on the assumption made in the Agri-footprint methodology (Mérieux NutriSciences Blonk, 2023)	Carbon dioxide, fossil
CO_2 emissions from urea to air	$= Urea \text{ applied (kg N)} * EF_{urea} * (44/12)$	Carbon dioxide, fossil
Direct N_2O emissions to air	$= EF_{directN_2O} * N \text{ applied from artificial fertilizer (kg N)} * 44/28$	Dinitrogen monoxide
Indirect N_2O emissions to air	$= (EF_{Ammonia} * Frac_{vol} * N \text{ applied from artificial fertilizer (kg N)} + Frac_{leach} * N \text{ applied from artificial fertilizer (kg N)} * EF_{Nitrate}) * (44/28)$	Dinitrogen monoxide
NO_3 emissions to water	$= N \text{ applied from artificial fertilizer (kg N)} * EF_{leach} * (62/14)$	Nitrate, {Country suffix}
PO_4 emissions to soil	$= P \text{ applied from artificial fertilizer (kg } PO_4)$	Phosphorus, {Country suffix}

For the application of organic fertiliser (manure) the following emissions were calculated, see **Table 34**:

Table 34 Type of emissions, calculation rules and selected elementary flows for organic fertiliser application (manure)

Emission	Calculation	Elementary flow
Ammonia emissions to air	$= \text{Frac}_{\text{volo}} * N \text{ applied from organic fertilizer (kg N)} * (17/14)$	Ammonia, {Country suffix}
Direct N ₂ O emissions to air	$= \text{EF}_{\text{directN2O}} * N \text{ applied from organic fertilizer (kg N)} * (44/28)$	Dinitrogen monoxide
Indirect N ₂ O emissions to air	$= (\text{EF}_{\text{Ammonia}} * \text{Frac}_{\text{volo}} * N \text{ applied from organic fertilizer (kg N)} + \text{Frac}_{\text{leach}} * N \text{ applied from organic fertilizer (kg N)} * \text{EF}_{\text{Nitrate}}) * (44/28)$	Dinitrogen monoxide
NO ₃ emissions to water	$= N \text{ applied from organic fertilizer (kg N)} * \text{EF}_{\text{leach}} * (62/14)$	Nitrate, {Country code}
PO ₄ emissions to soil	$= P \text{ applied from organic fertilizer (kg PO}_4\text{)}$	Phosphorus, {Country suffix}

M2.4 Emissions from crop residues

An IPCC (2019) tier 1 approach was used to calculate the N from crop residue decomposition. Thereby, default data presented in the IPCC methodology was used.

Calculation rules for the emissions were derived from the IPCC guidelines and FloriPEFCR (Broekema et al., 2024), see **Table 31** for the underlying methodologies. Based on N from crop residues direct and indirect N₂O emissions to the air and NO₃ emissions to water were calculated, see **Table 35**:

Table 35 Type of emissions, calculation rules and selected elementary flows for crop residues

Emission	Calculation	Elementary flow
Direct N ₂ O emissions from crop residues	$= \text{Total N from crop residues (kg)} * \text{EF}_{\text{DirectN2O}} * 44/28$	Dinitrogen monoxide
Indirect N ₂ O emissions from crop residues	$= \text{Total N from crop residues (kg)} * \text{EF}_{\text{Ammonia}} * \text{EF}_{\text{leach}} * 44/28$	Dinitrogen monoxide
NO ₃ emissions from crop residues	$= \text{Total N from crop residues (kg)} * \text{EF}_{\text{leach}} * 62/14$	Nitrate, {Country suffix}

Module 3: Energy Use

M3.1 Emissions from energy use of machinery

The energy consumption associated with on-farm machinery use is determined based on a comprehensive review of existing literature, supplemented by data collected on an individual basis for each specific case. A more advanced methodology needs to be developed to more accurately account for the impacts associated with on-farm energy use. This would involve a more nuanced approach, integrating a wider range of variables and considerations, to enhance the precision.

Module 4: Water Use

M4.1 The blue water consumption

To estimate the crop water use (i.e. blue water consumption), we use the following formula:

$$BW_c = BW_f * \text{Yield}$$

BW_c Blue water consumption in m³/ha/year

BW_f Blue unit water footprint from irrigation in m³/ton/year

Yield yield of the crop in ton/ha/year

The blue unit water footprint from irrigation is based on Mialyk et al. (2024). Average data between 2010-2019 on a national level was selected. Crop yields are derived from FAOstat and corresponds with the

information given in module M1.1 Yield. Blue water consumption from irrigation refers only to the potential volume of irrigated water consumed for transpiration and evaporation. Water volumes remained in the soil, returned to the system, or lost during conveyance are not included. Thus, we assume that the flow is given as consumptive water flow, and no factor has to be applied to account for the water-use efficiency. This means that the footprint as presented in Mialyk et al. (2024) from irrigation and capillary rise were used in the calculation of the blue water footprint.

Blue water consumption is reported using the elementary flow 'Water, unspecified natural origin' and the sub-compartment 'in water.' A country-specific suffix is added to make the elementary flow region specific.

M4.2 Emissions from energy use of irrigation

Energy use for irrigation depends on various factors, such as water source, water depth, type of pump etc. For sake of simplicity, we only distinguish between type of energy supply: electricity or diesel. We do not differentiate in energy use for different irrigation techniques. Default values are derived from the World Food Life Cycle Database (Quantis, n.d.), see **Table 39**.

Table 36 Default values for energy use of irrigation from the World Food Life Cycle Database (Quantis, n.d.)

Energy supply	Energy use
Electricity	0.239 kWh/m ³
Diesel	0.059 * 0.832 = 0.04956 kg/m ³ (the density of diesel is assumed to be 0.832 kg/l)

To convert the diesel to Megajoules it is assumed that the calorific value is 45 MJ/kg.

To estimate the type of energy supply per type of crop, we make the following assumptions (simplified based on the World Food Life Cycle Database (Quantis, n.d.), see Table 37.

Table 37 Assumptions regarding the type of energy supply per type of crop

Crop type	Default approach
Arable crops	Diesel powered
Orchard/Perennial crops	OECD countries: electricity powered Non-OECD countries: diesel powered

Electricity is connected to a country-specific dataset using the country's electricity consumption mix from ecoinvent (n.d.): *Electricity, low voltage| market for electricity, low voltage*. For the United States *Electricity, low voltage {{US}}| market group for electricity, low voltage* was selected.

Diesel is by default connected to the background dataset: *Diesel, burned in agricultural machinery {GLO}| diesel, burned in agricultural machinery* (ecoinvent, n.d.).

The total energy use for irrigation is then calculated using the formula:

$$Total\ energy\ use\ for\ irrigation\ (electricity\ -\ in\ kWh) = 0.239\ kWh * blue\ water\ footprint\ from\ irrigation$$

AND/OR

$$Total\ energy\ use\ for\ irrigation\ (diesel\ -\ in\ kg) = 0.059 * 0.832 * 45kg * blue\ water\ footprint\ from\ irrigation$$

Please be aware that blue water consumption is not the same as irrigation.

Module 5: Pesticides

M5.1 Emissions from pesticide production & application

To determine the pesticide usage per hectare, country-level FAOSTAT data on pesticide use was retrieved for the years 2020-2022 (Food and Agriculture Organization of the United Nations, n.d.-d). The agricultural use of pesticides, Insecticides, Herbicides, Fungicides and Bactericides were collected, as well as the use per area of cropland for pesticides. The country-level data on pesticide use per hectare was generalised for all crops.

No data on the use per area of cropland was available for Insecticides, Herbicides, Fungicides and Bactericides. Based on the agricultural use, an estimation of the use per area of cropland was calculated. The calculation was done in the following steps:

1. The average agricultural use per pesticide type and total pesticides and, the average use per area for pesticides were calculated for 2020-2022
2. The fraction of each pesticide type was calculated by:

$$\text{Fraction} = \frac{\text{Agricultural use pesticide type (insecticides, herbicides or fungicides and bactericides)}}{\text{Agricultural use pesticides}}$$

3. The fraction was multiplied with the use per area of cropland of pesticides:

$$\begin{aligned} \text{Use per area of cropland pesticide type (Insecticides, Herbicides and, Fungicides and Bactericides)} \\ = \text{Fraction} * \text{use per area of cropland pesticides} \end{aligned}$$

The background processes for pesticide production and application that were connected to the calculated use per area of cropland were retrieved from the Agri-footprint database (Mérieux NutriSciences | Blonk, 2023) and are:

- *Insecticide, at plant {RER}*
- *Herbicide, at plant {RER}*
- *Fungicide, at plant {RER}*
- *Insecticide emissions, at farm {GLO}*
- *Herbicide emissions, at farm {GLO}*
- *Fungicide emissions, at farm {GLO}*

Module 6: Land Use and Land Use Change

The release of GHG-emissions into the atmosphere due to deforestation is one of the major issues caused by the global agriculture production system (Poore and Nemecek, 2018). All carbon emissions and removals related to land use change retrieved from the LUC impact Tool for the year 2021 (Mérieux NutriSciences | Blonk, 2024), which follows the modelling guidelines of PAS 2050:2011 and the supplementary document PAS2050-1:2012 for horticultural products (BSI, 2012). Only direct land use changes (dLUC) are considered. Direct land use changes occur as the result of a transformation from one land use type into another, which takes place in a particular/certain piece of land cover, possibly leading to changes in the carbon stock of that of that specific piece of land, but not in other systems. dLUC is evaluative and only related to the crop under study. It does not take into account the global food system and interlinkages within the system. Table 38 lists the most important methodological choices involved in modelling emissions due to LUC.

Table 38 Methodological choices for modelling emissions due to LUC

Methodological choice	Description	Choice
Amortisation period/responsibility window	Period over which LUC emissions are depreciated (e.g. yearly, 20-years, 100-years).	20 years
Amortisation method	Method defining how much weight is put on recent vs. more historic LUC events (e.g., equal, linear).	Equal
Approach	Defining whether emissions from LUC event are only allocated to crops which are actually expanding in occupation (i.e. product specific) or all product produced in the assessment area are included in the analysis and allocated a share of LUC emissions (i.e. shared responsibility).	Product specific
Nitrogen mineralisation	N ₂ O emissions from Nitrogen mineralisation, related to the amount of soil carbon that is lost.	Included
Emissions from biomass burning	Methane (CH ₄) and nitrous oxide (N ₂ O) emissions can occur due to biomass burning in a LUC event.	Not included
Emission from peatland drainage	Emissions arising from peatland drainage included oxidation of carbon and mineralisation of nitrogen due to LUC.	Not included

LUC emissions might have a substantial impact on the climate change impact category and the results are uncertain, therefore the results are reported separately under the impact category climate change.

The elementary flow for carbon dioxide emissions from Land Use Change is reported separately under the flow 'Carbon dioxide, land transformation'.

Module 7: Other

Due to assumptions, limitations, uncertainty and its potential impact, peat oxidation is reported separately under the 'Climate Change' indicator. The name of this sub-category is 'Climate Change – peat oxidation'. Peat oxidation is currently not included due to a lack of a consistent methodology. Therefore, the value reported under 'Climate Change – peat oxidation' will always be zero.

M7.1 Methane emissions from rice cultivation

Flooded rice fields are a significant source of atmospheric methane (CH₄). Methane is emitted by anaerobic decomposition of organic matter in paddy field. Emissions are estimated per hectare, per country, using the formula:

$$Emission = \frac{EF * 1,000,000^2}{A}$$

Where:

Emission GHG emissions in kg CH₄ per hectare, per year (for a specific country)

EF Kt CH₄ emissions per country, per year³

A Rice paddy annual harvested area in a country, per ha, per year⁴

² Conversion factor from kilotons (kt) to kilograms (kg), ³ Kt emission retrieved from FAOstat for the years 2020, 2021, 2022, ⁴ Harvested area retrieved from FAOstat for the years 2020, 2021 and 2022

The approach does not allow to trace back under what conditions the rice is grown (e.g water management practices). These conditions may be highly variable in a country, and they can affect seasonal CH₄ emissions significantly.

The elementary flow is reported separately under the flow 'methane, biogenic'.

Step 3: Life Cycle Impact Assessment

In the Life Cycle Impact Assessment (LCIA) the potential environmental impacts derived from the LCI are evaluated. In other words, LCIA aims to assess the magnitude of contribution of each elementary flow (i.e. emission or resource use of a product) to an impact on the environment.

Selection of impact categories, category indicators and characterisation models

The selection of impact categories, category indicators and characterisation models needs to be consistent with the goal and scope of the study, as well as comprehensive regarding environmental issues related to the product system under study (Hauschild & Huijbregts, 2015). According to a comprehensive meta-study of agri-food LCA's by Poore and Nemecek (2018) shows the environmental impacts of today's food systems are related to climate change, freshwater eutrophication, marine eutrophication, terrestrial acidification, land use and water consumption. The environmental impacts of pesticides are not assessed in this meta study, but are known to have multiple negative impacts on the environment (Fantke, 2019). To not bear the risk of overlooking any potential hotspots and trade-offs, the environmental impact related to pesticides are deemed relevant to consider by using the impact category freshwater ecotoxicity.

For every LCA impact category the state-of-the-art method is selected for the impact assessment, see Table 39.

Table 39 *LCA impact categories and categorisation models covered in the dashboard*

Climate change	
Definition	This impact category represents the increase in the average global temperatures resulting from total greenhouse gas (GHG) emissions. The greatest contributor is generally the combustion of fossil fuels, such as coal, oil, and natural gas.
Indicator/unit	Global warming potential (GWP) in kg CO ₂ eq
Method	IPCC 2021
Freshwater eutrophication	
Definition	Eutrophication impacts on aquatic freshwater ecosystems is due to emission of substances containing phosphorus (P). P emissions are mainly caused by sewage treatment plants for urban and industrial effluents, and leaching from agriculture land. In the aquatic environment, P is considered a limiting factor. If too much P is added, algae grow too rapidly. This can have adverse effects, such as leaving water without enough oxygen for fish to survive.
Indicator/unit	Fraction of nutrients reaching freshwater end compartment (P) in kg P eq
Method	EUTREND model (Struijs et al., 2009)
Marine eutrophication	
Definition	The eutrophication impacts on marine ecosystems is due to emission of substances containing nitrogen (N). N emissions are caused largely by the agricultural use of fertilisers, but also by combustion processes. If too much N is added, algae and other plants may grow in excess. This can have adverse ecological effects, for example by creating anoxic zones which has negative consequences for the entire marine ecosystem.
Indicator/unit	Fraction of nutrients reaching marine end compartment (N) in kg N eq
Method	EUTREND model (Struijs et al., 2009)
Terrestrial acidification	
Definition	Acidification is one of the impact categories in LCA that measures the potential of a product or process to contribute to the acidification of soil and water. This impact category is characterised by the release of acidic compounds, such as sulfur dioxide (SO ₂) and nitrogen oxides (NO _x), which can result in acid rain and acidification of ecosystems.
Indicator/unit	Terrestrial acidification potential (TAP) in kg SO ₂ eq
Method	As applied in ReCiPe 2016
Land use	
Definition	Land is used and transformed for agriculture, roads, housing, mining or other purposes. The impacts can vary and include loss of the organic matter content of soil, loss of the soil itself (erosion), and therefore ultimately a reduction of species richness.
Indicator/unit	Agricultural land occupation potential (LOP) in M ² a crop eq
Method	As applied in ReCiPe 2016
Water consumption	
Definition	The withdrawal of water from lakes, rivers or groundwater can contribute to 'depletion' of available water.
Indicator/unit	Water consumption potential (WCP) in m ³
Method	As applied in ReCiPe 2016
Freshwater ecotoxicity	
Definition	This impact category refers to potential toxic impacts on an ecosystem, which may damage individual species as well as the functioning of the ecosystem. Some substances have a tendency to accumulate in living organisms.
Indicator/unit	Comparative toxic unit for ecosystems (CTU _e)
Method	USEtox 2.1 in in CTU _e

The LCI results are categorised into midpoints categories, such as climate change. The characterisation factors used for this purpose depends on the methodology employed. To calculate the midpoint impact category, the chosen method multiplies the substances that contribute to an impact category (i.e. the LCI results) by a characterisation factor that expresses the relative contribution of the substance. For example, carbon dioxide (CO₂) and methane (CH₄) both contribute to the impact category climate change. The characterisation factor for CO₂ in the climate change impact category can be equal to 1, while the characterisation factor of CH₄ can be 25. This means that the release of 1 kg CH₄ causes the same amount of climate change as 25 kg CO₂. The total result is expressed as kg CO₂ eq per FU of a product.

Step 4: LCA risk score calculation

The environmental impact of the LCA are translated into a risk score. Risk scores could play a meaningful role in interpreting and evaluating the environmental impacts related to a product's life cycle and to guide actions to avoid these negative impacts. The risk scores help to identify and assess adverse environmental impacts, enabling a better prioritisation in the early phases of a due diligence process or sustainable sourcing management.

Life Cycle Assessment (LCA) is a suitable method to evaluate and express the potential environmental impacts related to a product's life cycle. Individual LCA results can become more valuable in the context of a comparison of product-country combinations or in a contribution analysis to determine the most contributing aspects. Therefore, the LCA results in the dashboard represent relative expressions and do not predict impacts on category endpoints, the exceeding of threshold, safety margins or risks (ISO 14044:2006).

The LCA output was translated to risk scores from 1 (lower risk) – 5 (higher risk). The risk scores are calculated using an exponential method, structured into five distinct classes, with the class sizes increasing progressively from 1 (lower risk) to 5 (higher risk). The lower limit of the scoring scale is defined as 0, assuming that no environmental impact results in no associated environmental risks. The upper limit is established as the maximum recorded impact within each specific impact category, augmented by a 10% safety margin. This margin is incorporated to account for the possibility that certain product-country combinations with higher impacts may exist but are not yet included. This methodology ensures that sufficient variation is observed across different product groups, facilitating comparative assessments of commodities from various countries within the same product category (see Figure 5).

Given that the principal aim of this framework is to identify and assess key risks within a specific value chain, the risk scores are intended exclusively for intra-product category comparisons within each individual impact category. For instance, risk scores are only comparable among the same products from different producing countries, ensuring that the comparisons are contextually relevant and based on similar production processes. As a result, this approach necessitates different risk class boundaries and limits for each commodity and impact category, acknowledging the variability of impacts across diverse products.

The life cycle assessment (LCA) impact results for each individual impact category are displayed at the product-country level, with the corresponding risk score colour-coded from green (indicating lower risk) to red (indicating higher risk).

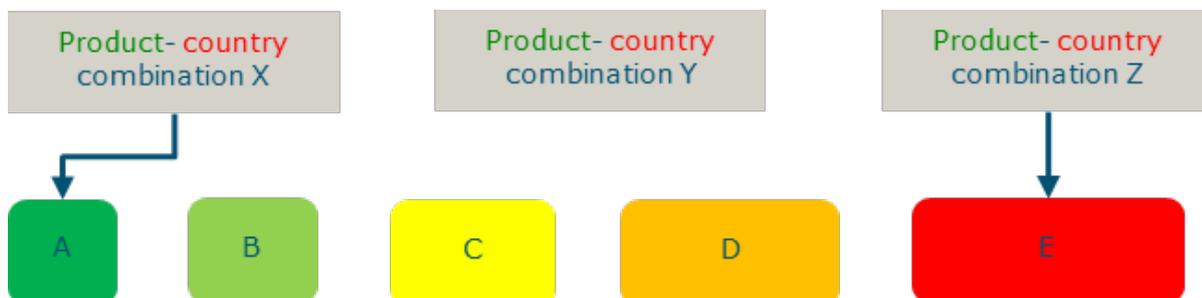


Figure 5 Visualisation of risk score logic

3.1.3 Theme-specific information

Acidification



Definition The impact category acidification measures the potential of a product or process to contribute to the increase of acid content in terrestrial and aquatic ecosystems. It addresses the environmental impacts due to the release of acidifying substances in the environment. Emissions of for example NO_x , NH_3 , and SO_x lead to the release of hydrogen ions (H^+) when gases are mineralised. The protons contribute to the acidification of soils and water when they are released in areas where the buffering capacity is low, resulting in forest decline and lake acidification.

Indicators Accumulated exceedance (AE) in mol H^+ equivalents. This indicator takes into account both the area exceeded and the magnitude of exceeded. AE is set to zero where critical loads are not exceeded. It should be denoted that the same AE can arise from a large exceedance and small exceeded area, or a small exceedance and a large area.

Climate change



Definition This theme describes changes in average global temperatures and weather patterns in a given period of time (i.e., 100 years). These changes are related to the emission of greenhouse gas emissions to air. The greatest contributor is generally the combustion of fossil fuels, such as coal, oil, and natural gas.

Indicators For climate change we use Global Warming Potential (GWP) over 100 years in kg CO_2 equivalents (IPCC, 2021). GWP is the potential contribution of a substance to the greenhouse effect. The effects are measured over a specified time horizon of 100 years, using the baseline model of 100 years of the IPCC (2021). The GWP is normalised to carbon dioxide. This means that all GHG emissions (CH_4 , N_2O , SF_6 , HFCs, and CFCs) are compared to the equivalent amount of the GWP of 1 kg of carbon dioxide. Climate change is a combination of four sub-indicators: climate change – fossil, climate change – biogenic, climate change – land use and land use change, climate change – peat oxidation.

Eutrophication



Definition Eutrophication stands for excessive levels of nutrients in the environment caused by emissions of nutrients to air, water and soil. Eutrophication is a process that sees the environment becoming enriched with nutrients. Eutrophication includes all impacts due to excessive levels of nutrients in the environment caused by emissions of nutrients to air, water and soil. N emissions are mainly caused during the application of fertilisers, but also during combustion processes. P emissions are mainly caused by sewage treatment plants for urban and industrial effluents, but also leaching from

agricultural land.

Indicators For eutrophication we use two indicators:

- Fraction of nutrients reaching marine end compartment, expressed in kilogram of Nitrogen equivalents for marine eutrophication. The EUTREND model (Struijs et al., 2009) as implemented in ReCiPe is used.
- Fraction of nutrients reaching freshwater end compartment, expressed in kilogram of Phosphorus equivalents for freshwater eutrophication. The EUTREND model (Struijs et al. 2009) as implemented in ReCiPe is used.

Ecotoxicity (freshwater)



Definition Freshwater ecotoxicity addresses the toxic impacts on an ecosystem, that damage individual species and change the structure and function of the ecosystem. Ecotoxicity is the result of a variety of different toxicological mechanisms cause by the release of substances with a direct effect on the health of the ecosystem.

Indicator For freshwater ecotoxicity we look at comparative toxic unit for ecosystems (CTU_e) based on the USEtox 2.1 model (Fantke et al., 2021), adapted as in Saouter et al., 2018.

3.2 Steps in calculation spatial risk scores

Spatial data refers to information about the physical location and characteristics of objects in the real world. This data can be represented using vector data, which uses graphical representations of the real world, or raster data, which presents data in a grids /pixels. There are numerous publicly available sources of spatial data, including OpenStreetMap, the World Resource Institute Data Explorer, remotely sensed climate and landcover imagery from space agencies like ESA and NASA, and the FAO Agro-Informatic Data Catalog.⁸² GIS software, such as ArcGIS or QGIS,⁸³ provide a wide range of tools to perform spatial analysis and modeling on both raster and feature data.

The spatial analysis approach is used to identify environmental risks at sub-national levels, helping pinpoint areas vulnerable to challenges like biodiversity loss, deforestation, and water stress. By integrating global spatial data with local production patterns, we generate risk scores that guide decision-making. The process consists of four key steps: 1) Theme-specific data collection: Selecting relevant data for each theme (e.g., biodiversity loss) from public sources, relying on secondary data without primary data collection; 2) Data Processing: Standardising and georeferencing the data to a common resolution (1x1 km) to ensure consistency; 3) Overlay and Aggregation: Combining theme-specific information with commodity production patterns to estimate the extent of risk within each sub-national unit; 4) Risk Scoring: Calculating weighted average risk scores based on harvested area, resulting in a final classification for each commodity-region combination (See Figure 6).

The following section provides a step-by-step explanation of the methodology, with the 'deforestation'-theme used as an example. See Section 4.4 for more methodological details on each of the specific themes. Appendix 7 given a detailed list of all data sources used in the spatial analysis methodology.

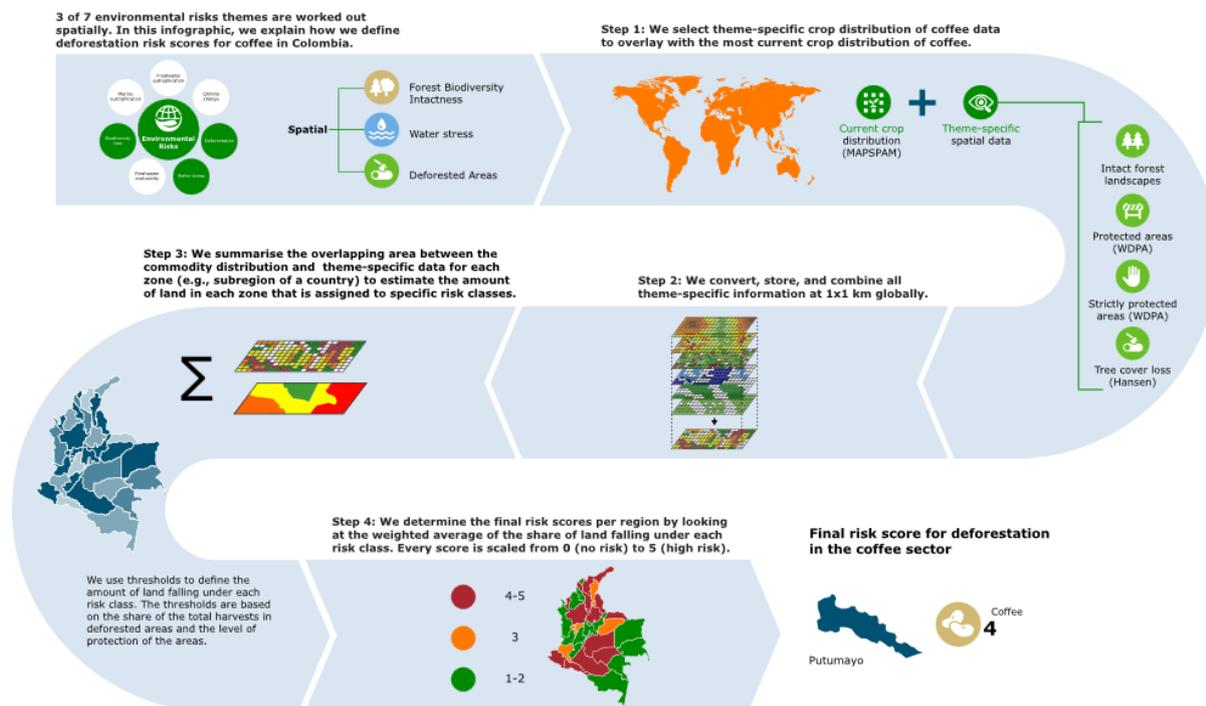


Figure 6 Spatial Environmental risk assessment methodology

⁸² OpenStreetMap (<https://www.openstreetmap.org>), World Resources Institute [WRI] Data (<https://datasets.wri.org>), ESA Copernicus Open Access Hub (<https://scihub.copernicus.eu>), NASA Earthdata (<https://earthdata.nasa.gov>), FAO Agro-Informatic Data Catalog (<https://data.apps.fao.org/catalog/>)

⁸³ ESRI-ArcGIS (<https://www.esri.com/>), QGIS (<https://qgis.org/>)

Step 1: Theme-specific data collection for the spatial risk analysis

We start by selecting relevant data sources for each theme (i.e. biodiversity loss, deforestation and water stress). The methodology relies on the assessment of secondary data derived from third party independent data sources. No primary data has been collected. The selection of indicators was based on WUR expertise on the environmental risk themes, combined with availability of third-party data and additional quality criteria related to the data sources as described in the human rights methodology (see the data selection criteria section in Section 2.3.1). The exact data sources that were selected can be found in the theme-specific sections in Section 3.3 and Appendix 7.

Example Step 1 on the risk of deforestation

This indicator uses as theme-specific spatial data:

1. Intact Forest Landscapes (IFL) – tracks large, undisturbed forests and their decline (based on status 2000 and 2020).
2. Protected Areas (WDPA) – identifies legally conserved zones like national parks.
3. Tree Cover Loss (2001–2020) – shows vegetation removal, which may indicate deforestation.

Step 1: We select theme-specific crop distribution of coffee data to overlay with the most current crop distribution of coffee.



Step 2: Converting, storing and combining all theme-specific information at 1x1 km globally

Before analysis, the raw data undergoes preprocessing: cleaning, filtering, and resampling to a consistent spatial resolution. Original datasets vary in format (e.g., polygons vs. rasters) and resolution, requiring standardisation for comparability. All data sources were standardised to a global coverage and ~1x1 km resolution using the WGS 1984 geographic coordinate system (EPSG 4326⁸⁴).

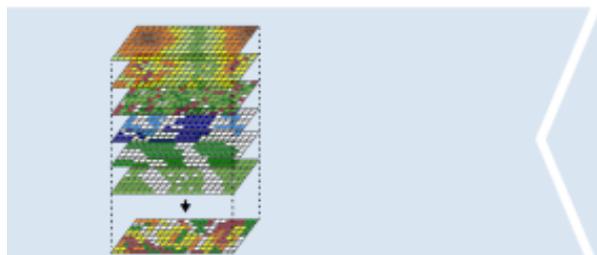
⁸⁴ In EPSG:4326 (WGS 84), coordinates are expressed in degrees; for practical GIS applications 30 arcseconds at the equator approximates ~1 km (actual: 926 meters) see: <https://epsg.io/4326>.

Example Step 2 on the risk of deforestation

Through the conversion to 1x1 km, we estimate globally for each 1x1 km grid-cell what level of forest protection is in place and how much deforestation took place: all input datasets were converted, stored, and combined at a uniform 1x1 km resolution, this involved:

- IFL & Protected Areas: Polygon data rasterised to binary 1x1 km grids based on dominance.
- Tree Cover Loss: Original dataset at 30m resolution globally, aggregated to show percentage-loss per 1x1 km cell.
- Crop Data (MAPSPAM): Harvested areas. Originally 5-minute at grid resolution, aligned to show the total estimated production (in hectares) at 1x1 km resolution.

Step 2: We convert, store, and combine all theme-specific information at 1x1 km globally.

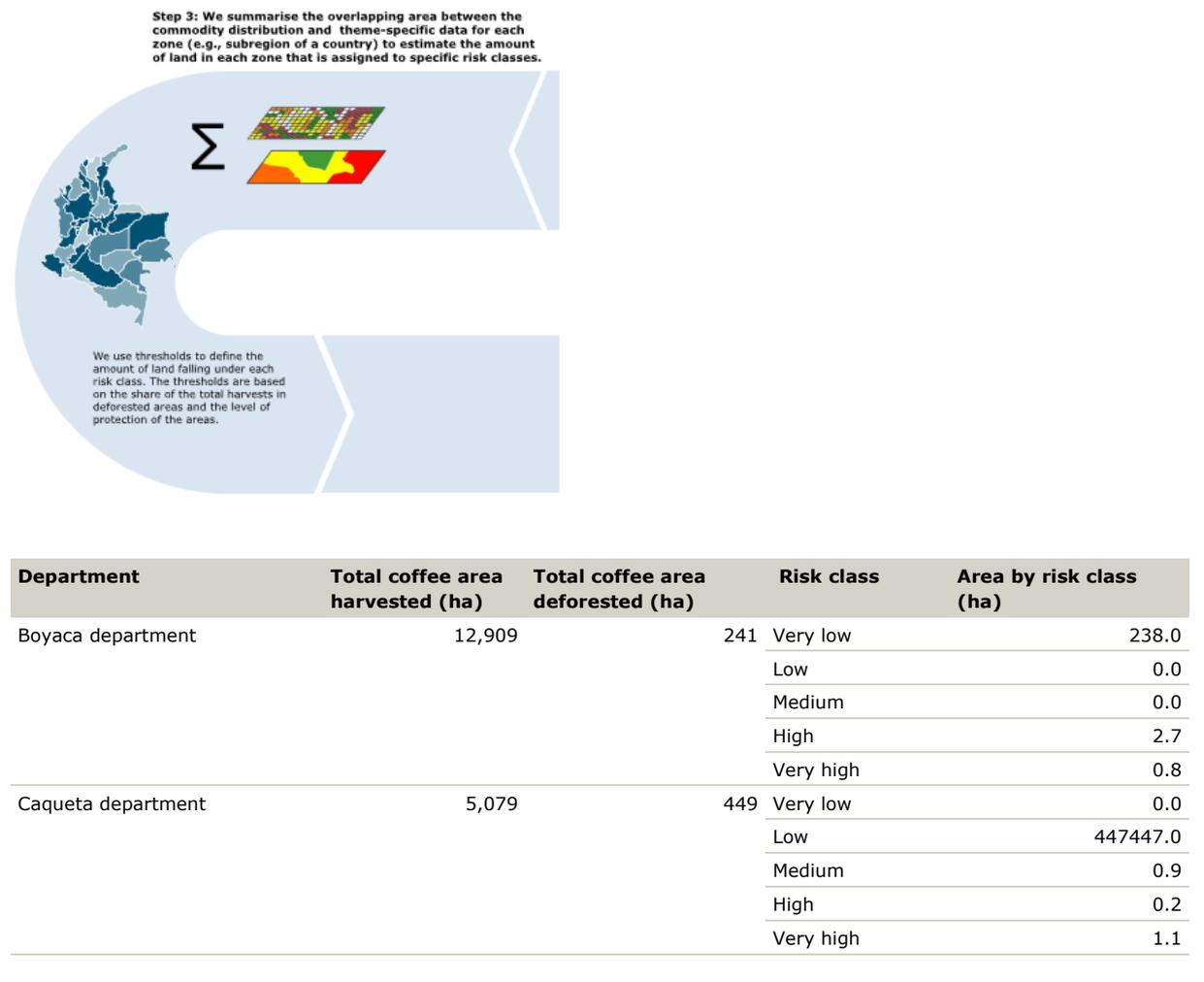


Step 3: Overlaying and aggregation of theme-specific information and commodity production patterns to estimate the amount of land in each subnational unit belonging to specific risk classes

The third step starts by overlaying the theme-specific information from step 2 with commodity production patterns, so that risk scores can be calculated for the production area of each commodity specifically. Commodity production data is converted to and stored at the same spatial resolution as the theme-specific information in step 2. In most cases, commodity production patterns are taken from MapSPAM (2020), which provides information on crop area, yield, and production at a 5-minute grid resolution, covering 42 crops. Using various inputs, the International Food Policy Research Institute's (IFPRI) Spatial Production Allocation Model (SPAM) employs a cross-entropy method to create plausible estimates of crop distribution within disaggregated units. By refining data from larger units like countries and sub-national provinces to smaller units such as grid cells, SPAM reveals spatial patterns of crop performance, creating a global grid landscape where geography meets agricultural production systems. For commodities not included in MapSPAM, other spatial sources are used, and assumptions may be made that take into account the production characteristics of specific crops (e.g. for specific nuts, spatial data of general nut production patterns may be combined with other secondary information on in which climates or which regions within countries specific nuts are grown).

Example Step 3 on the risk of deforestation in the coffee sector in Colombia

For deforestation we use thresholds developed by WUR to define the amount of land falling under each risk class. In the example of coffee in Colombia, we first overlay the data from step 2 with the production areas of coffee. Then, for each department in Colombia, we calculate how much land falls under each risk class as determined by the thresholds (see the section on deforestation in Section 4.6).



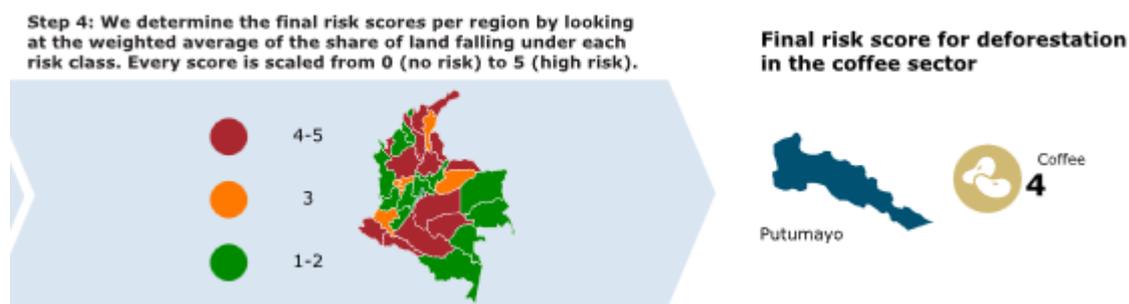
Afterwards, the data is aggregated to the highest level of subnational administrative divisions (ADM1, e.g. states in the US) by calculating what percentage of land in each subnational unit belongs to each different risk class (ranging from very low to very high). To address the uncertainties in the modeling process, we only scored subnational units with more than 10 hectares of land dedicated to the commodity of interest. The selected level of subnational administrative divisions was chosen to align with the human rights analysis. The definition of the risk classes, depending on the source, either comes from the source data, or a benchmarking table developed by WUR. For the biodiversity-loss theme we use a slightly different approach, that does not require the calculation of land per risk class per subnational unit. This approach is explained in the biodiversity loss section in Section 3.3.

Step 4: Determining the final risk scores

Taking the harvested area as weights, a weighted average is calculated over the different risk categories of the land falling under risk class. This weighted average is the final risk score for each combination of a commodity and subnational unit. We also calculate a national risk score by using the harvested area per subnational unit as a share of the harvested area at a national level. In the example below, in the Boyacá department, most of the total harvested area (238 ha representing 98% of the ha's) is classified as having very low risk. However, the weighted average of all total scores combined is 1.05, which results in the area being assigned a final risk score of 2 (low risk). In comparison, for Caquetá, the weighted average score is 2.01, which places the area in the 2-3 range, resulting in a final classification of 3 (medium risk).

Example on the risk of deforestation in the coffee sector in Colombia

For deforestation we use thresholds developed by WUR to define the amount of land falling under each risk class. In the example of coffee in Colombia, we first overlay the data from step 2 with the production areas of coffee. Then, for each Colombian department, we calculate the total land area within each risk class based on the established thresholds (see the section on deforestation in Section 4.6).



Department	Risk class	Area by risk class (ha)	Final risk score
Boyaca department	Very low	238.0	2 (low)
	Low	0.0	
	Medium	0.0	
	High	2.7	
	Very high	0.8	
Caqueta department	Very low	0.0	3 (medium)
	Low	447.0	
	Medium	0.9	
	High	0.2	
	Very high	1.1	

3.3 Theme-specific information for spatial risk scoring

Deforestation



Definition The EU deforestation regulation (EUDR, EU Regulation 2023/1115) mandates companies to assess and mitigate risks of sourcing illegally harvested timber. This involves analysing supply chains, verifying suppliers’ compliance with laws, and identifying risks like illegal logging. Companies must implement mitigation measures, such as sourcing from certified suppliers and maintaining detailed records. Continuous monitoring and review are required to ensure effectiveness. Although creating a globally applicable procedure is challenging, a spatial estimate of deforestation risks related to

crop harvesting can be made at a sub-national level. However, the lack of up-to-date global information on crop patterns limit precision.

Legislative compliance

The risk assessment required for compliance with EU deforestation regulation (EUDR, EU Regulation 2023/1115) on deforestation focuses on identifying and mitigating the risk of sourcing illegally harvested timber or timber products. Companies must analyse their supply chains, assessing the origins of raw materials, processing facilities, and transportation routes. Through due diligence procedures, they gather information on suppliers, verify compliance with laws, and assess the risk of sourcing illegally harvested timber. Risks, such as illegal logging or inadequate forest management, should be identified, and mitigation measures are implemented, such as sourcing from certified suppliers or establishing tracking systems. Detailed records of the assessment processes must be maintained, with continuous monitoring and review to ensure effectiveness. This comprehensive approach promotes responsible forest management and reduces the risk of illegal deforestation within the EU market.

Although it is challenging for a globally applicable procedure to obtain a comprehensive understanding of this complete analysis with the necessary details, such as management and implemented mitigation measures, it is feasible to do a global spatial estimate of the main risks regarding the impact of crop harvesting spatial patterns on deforestation at sub national level. However, in general, there is a lack of up-to-date global information for either the crop patterns or the exact deforestation patterns to achieve this level of precision.

Data sources

For the spatial assessment of deforestation, various global databases describe changes in tree cover based on spectral analysis of satellite images. Several sources are available, the best-known being Hansen et al. (2013). In this dataset, 'tree cover' is defined as all vegetation taller than 5 meters and can consist of natural forests or plantations with varying cover densities. 'Loss' indicates the removal or death of trees and can be due to a variety of factors, including harvest, fire, disease, or storm damage. As such, 'loss' does not equate to deforestation. The dataset is created annually and provides tree cover loss at 30x30m resolution for the period 2001-2023.⁸⁵ Other approaches use different satellites and slightly different methodologies, but are comparable in the type of result. An example alternative data source is the integrated deforestation alerts compiled by Global Forest Watch (globalforestwatch.org). This dataset merges deforestation warnings from 2019 onwards from three warning systems into a single, integrated deforestation warning layer (Global Land Analysis and Discovery (GLAD), Potapov et al (2022)): GLAD-L, GLAD-S2, RADD). This integration is showing deforestation events faster than with a single system alone, as the integrated layer is updated when any of the source warning systems are updated. Although called 'deforestation alerts,' these alerts also detect (like Hansen et al. (2013)) forest or tree cover disturbances. This dataset is only available for the (sub)tropical climate zones.

As these products do not differentiate between human-induced and other types of disturbances they may include a wide range of acceptable forest changes like timber harvesting operations, which may not result in a conversion to non-forest land use, or the rejuvenation of coffee areas through tree removal and replanting.

The term 'deforestation' is nevertheless frequently used because these events have the potential for deforestation, and further investigation is required to confirm this. Because of this shortcoming, we have concluded that for a comprehensive global spatial risk indicator related to impact of cropping systems on forest ecosystems, it is crucial to integrate tree cover loss needs to be assessed over a defined period (e.g. 2001-2020, or 2020-2024) with datasets that reflect:

- The degree of protection by (inter-)national laws
- The degree of pristine/completeness of the forest ecosystem
- The degree of spatial overlap of these combined categories by the specific crop types
- The spatial unit for aggregation (Global administrative units at Level 1)

Therefore, the spatial deforestation indicator is created combining the following data sources:

- Intact Forest Landscapes (IFL),^{xxv} which identifies the world's unfragmented forest landscapes, large enough to retain all native biodiversity and showing no signs of human alteration as of the year 2020. This layer also shows the reduction in the extent of Intact Forest Landscapes from 2000 to 2020.
- Protected areas and strictly protected areas (IUCN IA/B,II) from the World Database on Protected Areas (WDPA),^{xxvi} displaying areas that are legally protected according to various designations (e.g., national parks, state reserves, and wildlife reserves) and managed to achieve conservation objectives
- Tree cover loss^{xxvii} 2001-2024. In this data set, 'tree cover' is defined as all vegetation greater than 5 meters in height, and may take the form of natural forests or plantations across a range of canopy densities. 'Loss' indicates the removal or mortality of tree cover and can be due to a variety of factors, including mechanical harvesting, fire, disease, or storm damage. As such, 'loss' does not equate to deforestation. The term 'deforestation' is nevertheless frequently used because these events have the potential for deforestation, and further investigation is required to confirm this. Currently, the indicator uses the timeframe of the total loss 2001-2020.
- MAPSPAM Crop Areas,^{xxviii} which includes crop area, yield, and production at a 5-minute grid resolution, used to estimate the total harvest in deforested areas.

⁸⁵ 2024 (based on [Hansen Global Forest Change v1.12 \(2000-2024\)](#)) is expected to be ready summer 2025, when processing of the risk scores is finished. Comparable (yearly) updates of the deforestation indicator are technically feasible.

Section 3.2 describes the general procedure used when calculating the spatial risk scores. Step 3 in this procedure is the overlaying and aggregation of theme-specific information and commodity production patterns after the conversion to a 1x1 km resolution of all data sources. In the case of deforestation, step 3 combines many different data sources. The reasoning behind this, as well as the exact method for overlaying and aggregation can be found in the four sub-steps below.

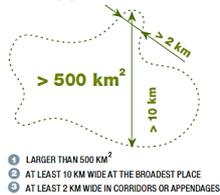
Step 3.1 Define and extract areas of importance for Forest Biodiversity

Intact Forest Landscapes (IFLs, Potapov et al 2008) and Protected Areas (Pas, World Database on Protected Areas (WDPA)) are critical for conserving biodiversity, as they provide habitats for a wide range of plant and animal species. Deforestation in these areas can be considered severe risks. By overlaying IFLs and PAs, we can identify and evaluate the risks in areas where conservation efforts are concentrated and assess the effectiveness of protected area networks in safeguarding intact forest ecosystems:

- Intact Forest Landscapes (IFLs) represent large pristine forest areas untouched by human activity, essential for biodiversity preservation and carbon sequestration. The maps are created collaboratively by organisations like Greenpeace and the University of Maryland. IFL maps serve various purposes, including forest degradation assessments, conservation strategies, and scientific research. Initially mapped in 2005, subsequent updates in 2013, 2016, and 2020 ensure consistency in methodology and data sources, facilitating accurate analysis of global forest landscape changes over the period 2000-2020. By identifying these pristine forest areas with high conservation value and monitoring changes in forest cover, IFL mapping contributes significantly to global efforts aimed at preserving Earth's forest ecosystems and combating deforestation.

What is an Intact Forest Landscape (IFL)?

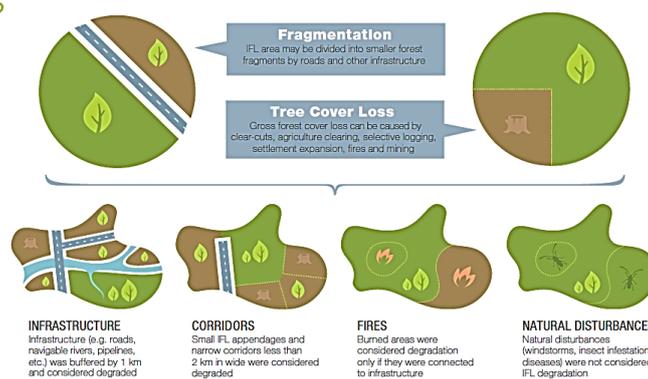
An unbroken expanse of natural ecosystems (both forests and non forests) within the zone of current global forest extent, showing no signs of significant human activity and large enough that all native biodiversity, including viable populations of wide-ranging species, could be maintained



COMPONENTS OF FOREST LANDSCAPE



IFL Degradation



Degradation Analysis Results



Figure 7 Overview of the IFL delineation method (Potapov et al 2008)

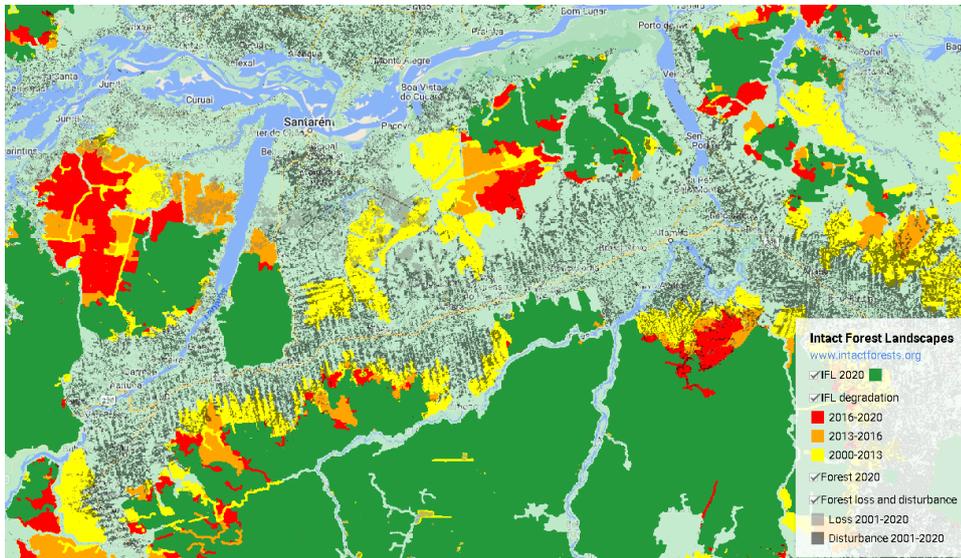


Figure 8 Example of the change of the IFL areas over time in the Brazilian Amazon forests near Santarém (intactforest.org). overlaid with the exact forest loss and disturbance from 2001-2020 according to Hansen et al. (2013). This map does not include the PAs

- Protected areas (PAs) are crucial components of conservation strategies globally, covering nearly 12% of the world’s land surface. They serve to safeguard biodiversity, provide ecosystem services, mitigate climate change, and protect cultural and spiritual sites. Managed by various stakeholders, from governments to private entities, they encompass a wide range of landscapes and governance structures. The International Union for Conservation of Nature (IUCN) provides a framework for classifying protected areas in 7 categories, with Category I-III describing the stricter protected areas and the most natural conditions (www.iucn.org/pa_categories): Ia; Strict Nature Reserves. Ib; Wilderness Areas. II; National Park. III; National Monument. IV; Habitat and Species Management Areas. V; Protected landscape (modified landscapes of cultural ecological and scenic value) and VI; Protected Areas with Sustainable use of natural resources. From a broader biodiversity conservation and forest management perspective, categories Ia/b-II are stricter linked to nullifying deforestation and in our risk analysis we draw a distinction between categories Ia/b-II (Strictly protected) and III-VI (Protected).

Both datasets are merged into one global raster dataset describing their combinational types (protection type and intact forest y/n).

Step 3.2 Identifying and mapping deforested areas, Forest Loss and Degradation

By identifying and mapping actually deforested areas within IFLs and PAs, we gain insights into the drivers of forest loss and assess the deforestation pressures and risk. Utilising deforested areas derived from Landsat time-series imagery Hansen et al (2013) enables us to monitor changes in forest cover over time with high spatial resolution (30x30 m).

Forest risk is dynamic and can vary from year to year due to factors such as land-use changes, policy decisions, and natural disasters. Currently the run is done for the total available period of deforestation.⁸⁶ The method can be annually updated which allows to track changes in forest risk over time and implement timely interventions to address emerging threats.

Step 3.3 Identifying Harvested Areas at High Risk of Deforestation

By spatially overlaying IFL/protected areas (Step 3.1) and the deforested areas as defined by Hansen et al (2013) (Step 3.2) with estimates of crop distribution from MapSPAM, we can identify areas where agricultural expansion encroaches upon pristine forests. This spatial analysis enables us to quantify the proximity of agricultural activities to intact forest areas, highlighting regions at high risk of deforestation.

⁸⁶ The period 2020-current is still being processed, potentially showing the insights in the latest EUDR regulation timelines.

Step 3.4 Summarisation per subnational unit

Finally, assessing forest risk at the administrative unit level enhances the relevance and applicability of the findings for decision-makers at the local and regional levels. By disaggregating forest risk assessments by administrative units, such as provinces, we can tailor conservation strategies to specific socio-economic and environmental contexts. Transitioning data from 1x1 km² raster-based pixels to area-based indicators requires a weighting process to accurately assess the accountability and severity of deforestation. To accomplish this, a 5-class dual protocol, built upon prior steps, is utilised to allocate risk across GADM Level 1 units worldwide. This protocol is shown in the table below.

Table 40 Deforestation risk score calculation and weighing rules

Minimum mapping unit = 10 ha harvested		% of total harvest in deforested areas (2001-2020)						Extremely High No crop / No deforestation
		Risk	Very low	Low	Medium	High	0%	
Category WDPA and IFL	Base Risk - % Deforestation based	<5%	5-10%	10-25%	25-50%	>50%	0%	
		Not Protected; Outside current or former IFL area (2000-2020)	Low	1	1	2	3	4
Not Protected; Inside former IFL area (<2020)	Medium	3	3	3	3	4	5	0
Not Protected; Inside current IFL area (2020)	High	4	4	4	4	4	5	0
Protected; Outside current or former IFL area (2000-2020)	High	4	4	4	4	4	5	0
Protected; Inside current or former IFL area (2005-2020)	Extremely High	5	5	5	5	5	5	0
Strictly protected (IUCN I, II or III); In- or outside IFL area	Extremely High	5	5	5	5	5	5	0

Water stress



Definition Water stress occurs when water demand exceeds supply or when poor water quality limits its use. It results from factors like population growth, industrial activity, and climate change, leading to shortages, reduced agricultural yields, and ecological impacts. By combining data on water stress with crop production patterns, we estimate a risk score of crop-related water stress.

Data sources and indicator selection

For the calculation of water stress risk scores, we rely on Aqueduct 4.0, which is a comprehensive water risk framework aimed at simplifying complex hydrological data into understandable risk indicators, developed by the World Resources Institute (WRI). It contains 13 water risk indicators covering quantity, quality, and reputational risks, sourced from open-access, peer-reviewed data. Most of these 13 indicators are quite specific (e.g. flood risks). For an overall water risk score, the indicators 'baseline water stress' and 'baseline water depletion,' both calculated with the PCR-GLOBWB 2 model,⁸⁷ are most relevant. The following paragraph describes why we chose 'baseline water stress' as the basis for our water risk score.

⁸⁷ Five of the basic 13 indicators from the Aqueduct indicators are based on the PCR-GLOBWB 2, an open source global hydrological model created by the University of Utrecht ([Sutanudjaja et al., 2018](#)). PCR-GLOBWB 2 is a hydrological model that operates on grid cells covering the globe in roughly 10 km x 10 km each, on a time step basis. It replicates the movement and storage of moisture, including water exchanges between soil, atmosphere, and groundwater reservoirs. The model typically produces outputs

Within Aqueduct 'Baseline Water Stress' (BWS) and 'Baseline Water Depletion' (BWD) are two key indicators evaluating global water risks which are calculated with the BWS assesses the ratio of total water demand to available renewable surface and groundwater supplies. It reflects the pressure on water resources, considering demands from domestic, industrial, and agricultural sectors against available supplies. This indicator aids in pinpointing regions facing significant water scarcity, guiding strategic resource management. Meanwhile, BWD examines the ratio of total water consumption, including consumptive uses like irrigation and industrial processes, to renewable water supplies (surface and groundwater). It offers insights into the sustainability of water use, identifying areas where human activities exhaust water resources beyond their local natural replenishment rates. Higher values indicate larger impact on the local water supply and decreased water availability for downstream users. BWS measures total competition on available water resources, while baseline water depletion indicates the impact on local water supplies. BWD is calculated identical to BWS; however, instead of looking at *total water demand* (consumptive plus non-consumptive), BWD is calculated using *consumptive withdrawal only*. Therefore the total calculation (BWS) from the PCR-GLOBWB 2 model is seen as a more complete picture for the dashboard, especially when overlaid with the exact cropped areas.

The BWS- indicator is already classified by Aqueduct into 5-scale risk scores per sub-basin based on severity of the water issues they represent. These sub-basin scores can be aggregated into country and provincial administrative boundaries using a weighted average approach, where sub-basins with higher demand have more weights in the final administrative score. Because the indicators in aqueduct are already aggregated into composite 0-5 scores, and because different equations are used for each composite indicator, we prefer using a single indicator over combining several indicators.

It is important to note that overall water risk, being unmeasurable directly, is not validated and thus Aqueduct serves primarily as a prioritisation tool, requiring supplementation with local and regional assessments.

Overlaying and aggregation of theme-specific information and commodity production patterns

Section 3.2 describes the general procedure for calculating spatial risk scores. Step 3 in this procedure is the spatial overlaying and aggregation of theme-specific information and commodity production patterns after all data sources have been converted to a 1x1 km resolution. In the case of water stress, step 3 overlays 'baseline water stress' data with crop production patterns. This results in identifying the area of land within each subnational unit that corresponds to each 'baseline water stress' risk class. These aggregated data are then used as inputs for calculating the final risk scores in step 4.

The table below shows the definition of the different risk classes, where the percentages refer to the ratio of the total water demand to available renewable surface and groundwater supplies. The annual water stress is calculated by applying a weighted average of monthly values, with total demand as the weight.

Table 41 *Water stress risk score calculation*

Normalised annual score	Risk Class Baseline water stress
0-1 = class 1	Low (<10%)
1-2 = class 2	Low - Medium (10-20%)
2-3 = class 3	Medium - High (20-40%)
3- 4 = class 4	High (40-80%)
4 - 5 = class 5	Extremely High (>80%)
	Arid and Low Water Use (see manual)

such as surface runoff, interflow, and groundwater recharge, along with simulations of water routing across the terrain. Using this hydrological model, water supply, demand, stress, depletion, and variability were aggregated at sub-basin level for current and projected climate conditions.

Biodiversity loss



Definition With biodiversity loss we refer to the change in ecological communities in response to human pressures. It involves a decrease in the variety of life, including genes, species, and biological communities, which can lead to ecosystem dysfunction and extinction. The EU Corporate Sustainability Due Diligence Directive (CSDDD) explicitly addresses biodiversity loss as part of its broader environmental impact obligations. The CSDDD requires companies to identify, assess, and mitigate adverse environmental impacts, including biodiversity loss and ecosystem degradation,

throughout their supply chains. Companies must develop strategies to ensure their operations align with sustainable practices and contribute to preserving biodiversity. Also, the EUDR is aimed at bringing down biodiversity loss.

Indicators and data sources

The main data source used for the biodiversity loss risk score is the Projected Biodiversity Intactness for the year 2020 (Gassert et al., 2022). The reasoning for the use of the biodiversity intactness index, and the exact source of the biodiversity intactness index is described in this section.

The Biodiversity Intactness Index (BII), described by Scholes and Biggs (2005), is a metric designed to assess the level of biodiversity intactness across terrestrial ecosystems worldwide. It measures biodiversity change by analysing the abundance and compositional similarity of species from observed biodiversity data in relation to an undisturbed ecosystem baseline. Scholes & Biggs (2005) discussed the need for a biodiversity indicator that did meet several criteria as set by the Convention on Biological Diversity (CBD). These criteria include scientific soundness, sensitivity to changes at relevant spatial and temporal scales, comparability with baseline situations and policy targets, use in future projections, and the ability to be aggregated at various levels. Many biodiversity metrics fail to meet these criteria. Some require complete knowledge of species populations or rely on extinction risk of individual species or protected areas, both of which have limitations which is not feasible globally, while others are scale-dependent and difficult to interpret across regions.

The BII therefore focuses on changes in species abundance across a broad range of species and ecosystems, while accounting for global habitat loss, overexploitation, and pollution. The BII was specifically designed to provide a sensitive, realistic, and policy-relevant measure of biodiversity loss.

The core BII-methodology relies on two key metrics:

1. **Abundance:** Measures the number of individuals from various species in an area compared to an intact ecosystem baseline.
2. **Compositional Similarity:** Compares the species composition of a given area to that of a natural ecosystem.

The BII combines these metrics to evaluate how human activity alters local biodiversity. The results are normalised on a 0-1 scale, with higher values indicating healthier ecosystems (0 being totally degraded and 1 being in a pristine state).

Many BII implementations are based on the Projecting Responses of Ecological Diversity in Changing Terrestrial Systems (PREDICTS) database, aggregating biodiversity observations from over 750 global studies, and more than two million data points. Essentially, PREDICTS tracks how local terrestrial biodiversity responds to human activities. Building on this evidence, the Biodiversity Intactness Index (BII) method models how species richness and abundance are influenced by land-use pressures, using predictor variables like land use, land use intensity, human population density, and proximity to the nearest road. The resulting values reflect the change in biodiversity relative to a baseline of undisturbed, intact ecosystems.

The BII model by Scholes and Biggs (2005), was refined over the years to improve accuracy, using other and more detailed predictor variables. Newbold et al. (2016) and Hill et al. (2018), mapped global biodiversity loss in relation to human land use around 2005. An update by Sanchez-Ortiz et al. (2019) incorporated high-resolution data, distinguishing between island and mainland ecosystem vulnerabilities. De Palma et al. (2024) further enhanced spatial resolution and extended the biodiversity data range from 2000 to 2020,

enabling more up-to-date monitoring. A recent initiative from Gassert et al., (2022) refined the BII framework by integrating human pressure data at a 100-meter spatial resolution globally. This latest approach combines observed biodiversity data with detailed globally available spatial predictors like land cover, road proximity, and urbanisation patterns to model biodiversity changes from 2017 to 2020. BII by Gassert et al. (2022) is computed on Google Earth Engine and available under a [CC BY 4.0 licence](#), which makes it possible to be further shared and adapted.

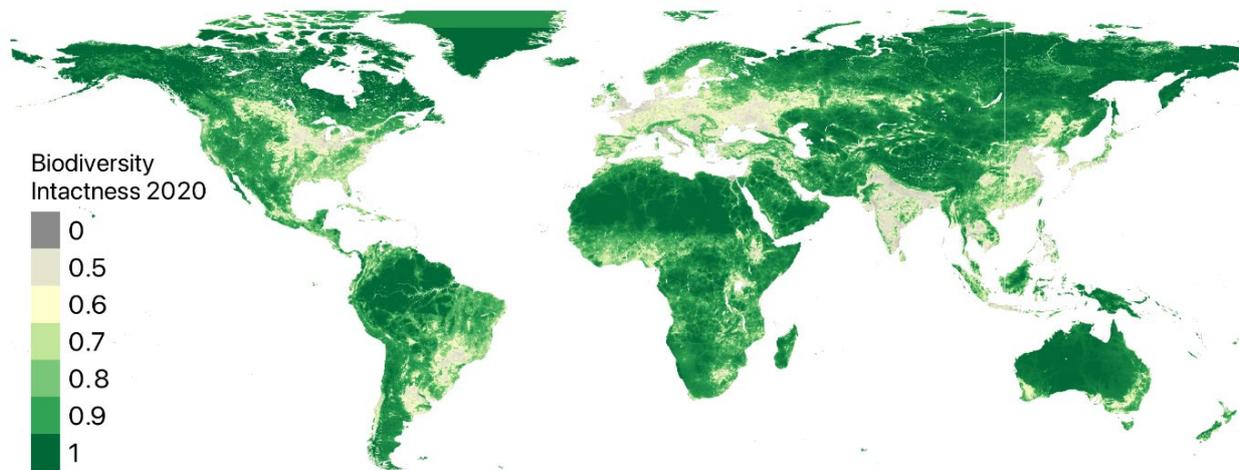


Figure 9 Projected Biodiversity Intactness for the year 2020 (Gassert et al., 2022)

While the BII is calculated as a continuous index it can be categorised into different thresholds to assess the level of biodiversity intactness in an area. While specific thresholds can vary slightly depending on the source or study, BII-scores can be interpreted as:

- Pristine (BII ≥ 0.95): Areas with scores in this range are considered to have high biodiversity intactness, reflecting ecosystems that are minimally impacted by human activities.
- Natural (BII ≥ 0.8): Areas with scores in this range are considered to have high biodiversity intactness, reflecting ecosystems that are minimally impacted by human activities.
- Semi-natural (BII 0.5 - 0.8): These areas have experienced some level of human disturbance but still maintain a significant amount of their natural biodiversity. They may include landscapes that have been altered but still support a variety of native species.
- Managed (BII 0.2 - 0.5): This category includes areas that are actively managed for specific purposes (e.g., agriculture, forestry) and have lower biodiversity intactness due to significant alterations to the ecosystem.
- Anthropogenic (BII < 0.2): These areas are heavily impacted by human activities and exhibit low levels of biodiversity. They may include urbanised regions, industrial areas, or heavily farmed landscapes.

Gassert et al. (2022) highlight three main limitations in using Global BII-scores:

1. Local Scale Interpretation: The maps provide a snapshot of biodiversity, but they don't account for all factors influencing local ecosystems. They may show 'intact' sites that are already heavily degraded, as very few areas are untouched by human activity.
2. Invisible Pressures: Some pressures like pollution, poaching, disease, and habitat fragmentation are hard to detect from satellite images and might not be well represented in the maps. This could lead to incorrect conclusions about the health of local ecosystems, especially when some human activities, like grazing, are not properly reflected.
3. Ecosystem Sensitivity: The maps do not consider how different ecosystems respond to human pressures. Some ecosystems might be more vulnerable and degraded than the maps suggest, so the scores could be misleading for sensitive or isolated communities.

Overlaying and aggregation of theme-specific information and commodity production patterns

Section 3.2 describes the general procedure used when calculating the spatial risk scores. Step 3 in this procedure is the overlaying and aggregation of theme-specific information and commodity production

patterns after the conversion to a 1x1 km resolution of all data sources. In the case of biodiversity loss, step 3, and as a result also step 4, are conducted in a slightly different way compared to deforestation and water stress. For biodiversity loss, we do not first calculate the area per risk category for each subnational unit, but the biodiversity risk score is immediately calculated at the subnational level from the biodiversity intactness index.

Like the other risk indicators, the actual production data from MAPSPAM was globally overlaid and summarised using the level 1 administrative areas. The resulting data shows average BII scores per administrative unit in terms of total area. To assess weighted risk, the total cropped area of a commodity was considered within the risk categories.

Based on the classification of BII scores, the following risk categories were defined:

- 0: Less than 10ha harvested – these are not presented in the dashboard
- 1: Very Low Risk: More than 10ha harvested, average BII Score < 0.5
- 2: Low Risk: More than 10ha harvested, average BII Score 0.5 - 0.6
- 3: Medium Risk: More than 10ha harvested, average BII Score 0.6 - 0.7
- 4: High Risk: More than 10ha harvested, average BII Score 0.7 - 0.8
- 5: Very High Risk: More than 10ha harvested, average BII Score > 0.8

It is important to note that when using average values, the highest BII scores (those most concerning biodiversity) tend to be less prominent. This is because averaging the data naturally dampens the peak BII scores resulting from the overlap between commodity production and biodiversity loss. However, the average BII score provides a more balanced representation of the total impact on biodiversity in a region.

An alternative approach would be to include a rule where a region is classified as 'Very High Risk' if a considerable percentage of production occurs in areas with BII scores > 0.8. However, choosing the percentage and BII threshold for this rule is very subjective, and for this reason, it has not been implemented.

Inquiries and support

For inquiries related to the methodology, risk scores and other technical aspects, please contact researcher [Valerie Janssen](#).

For general inquiries or requests for different combinations, please reach out to programme manager [Willem Ruster](#).

Sources and literature

- Broekema, R., Helmes, R., Vieira, M., Hopman, M., Gual Rojas, P., Ponsioen, T., Weststrate, J., & Verweij-Novikova, I. (2024). Product environmental footprint category rules for cut flowers and potted plants: Final version. <https://doi.org/10.18174/549543>
- BSI. (2012). *PAS 2050-1: 2012 Assessment of Life Cycle Greenhouse Gas Emissions from Horticultural Products*. BSI.
- De Palma, A., Contu, S., Thomas, G. E., Duffin, C., Nix, S., & Purvis, A. (2024). The Biodiversity Intactness Index developed by The Natural History Museum, London, v2.1.1. Data set. <https://doi.org/10.5519/k33reyb6>
- ecoinvent. (n.d.). *ecoinvent database*. Retrieved February 12, 2025, from https://ecoinvent.org/database/?_gl=1*1fqrit*_up*MQ..*_ga*NDawNDY3MjYxLjE3MzkzNjY1MTA.*_ga_C1J3MVCVZN*MTczOTM2NjUxMC4xLjAuMTczOTM2NjUxMC4wLjAuMA..*_ga_3P8YT7402Y*MTczOTM2NjUxMC4xLjAuMTczOTM2NjUxMC4wLjAuMA..
- Fantke, P. (2019). *Modelling the environmental impacts of pesticides in agriculture*. In *Burleigh Dodds series in agricultural science* (pp. 177–228). <https://doi.org/10.19103/as.2018.0044.08>
- Food and Agriculture Organization of the United Nations. (n.d.-a). *Crops and livestock products*. <https://www.fao.org/faostat/en/#data/QCL>
- Food and Agriculture Organization of the United Nations. (n.d.-b). *Land Use*. <https://www.fao.org/faostat/en/#data/RL>
- Food and Agriculture Organization of the United Nations. (n.d.-c). *Livestock Manure*. <https://www.fao.org/faostat/en/#data/EMN>
- Food and Agriculture Organization of the United Nations. (n.d.-d). *Pesticides Use*. Retrieved December 12, 2024, from <https://www.fao.org/faostat/en/#data/RP>
- Gassert, F., Mazzarello, J., & Hyde, S. (2022). *Global 100m projections of biodiversity intactness for the years 2017-2020: Technical white paper*. Vizzuality & Impact Observatory. https://ai4edatasetspublicassets.blob.core.windows.net/assets/pdfs/io-biodiversity/Biodiversity_Intactness_whitepaper.pdf
- Hauschild, M., & Huijbregts, M. (2015). *Life Cycle Impact Assessment*. In *LCA compendium*. <https://doi.org/10.1007/978-94-017-9744-3>
- Hill, S.L.L., Newbold, T., Contu, S., & Purvis, A. (2018). *Worldwide impacts of past and projected future land-use change on local species richness and the biodiversity intactness index*. bioRxiv. <https://doi.org/10.1101/311787>
- Hudson, L.N., et al. (2017). *The Database of the PREDICTS (Projecting Responses of Ecological Diversity In Changing Terrestrial Systems) Project*. *Ecology and Evolution*, 7(1), 145–188. <https://doi.org/10.1002/ece3.2579>
- IFASTAT. (n.d.-a). *Consumption*. <https://www.ifastat.org/databases/plant-nutrition>
- IFASTAT. (n.d.-b). *IFA Fertilizer Converter*. <https://www.ifastat.org/converter/fertilizer-converter/>
- ILO Department of Statistics. (2018). *Resolution concerning the methodology of the SDG indicator 8.8.2 on labour rights*. International Labour Office, Geneva.
- International Labour Organization. (2022). *Social Dialogue Report 2022 – Collective bargaining for an inclusive, sustainable and resilient recovery*. ILO Publishing, Geneva.
- IPCC. (2019). *2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories* (E. Calvo Buendia et al., Eds.; Vol. 4). IPCC. <https://www.ipcc-ngqip.iges.or.jp/public/2019rf/vol4.html>
- ISO. (2006). *ISO 14044:2006 Environmental management — Life cycle assessment — Requirements and guidelines*. <https://www.iso.org/standard/38498.html>
- Ludemann, C.I., Gruere, A., Heffer, P., & Dobermann, A. (2022). *Global data on fertilizer use by crop and by country*. *Scientific Data*, 9(1), 501. <https://doi.org/10.1038/s41597-022-01592-z>
- Mérieux NutriSciences | Blonk. (2023). *Agri-footprint 6 and Agri-footprint FLAG Methodology Report - Part 2: Description of Data*. <https://blonksustainability.nl/tools-and-databases/agri-footprint>
- Mérieux NutriSciences | Blonk. (2024). *LUC impact Tool*.

-
- Mialyk, O., Schyns, J. F., Booij, M.J., Su, H., Hogeboom, R.J., & Berger, M. (2024). *Water footprints and crop water use of 175 individual crops for 1990–2019 simulated with a global crop model*. *Scientific Data*, *11*(1), 206. <https://doi.org/10.1038/s41597-024-03051-3>
- Newbold, T., Hudson, L.N., Arnell, A.P., Contu, S., De Palma, A., Ferrier, S., Hill, S.L.L., Hoskins, A.J., Lysenko, I., Phillips, H.R.P., Burton, V.J., Chng, C.W.T., Emerson, S., Gao, D., Pask-Hale, G., Hutton, J., Jung, M., Sanchez-Ortiz, K., & Purvis, A. (2016). *Has land use pushed terrestrial biodiversity beyond the planetary boundary? A global assessment*. *Science*, *353*(6296), 288–291. <https://doi.org/10.1126/science.aaf2201>
- NutriNorm. (n.d.). *De samenstelling van organische meststoffen*. <https://nutrinorm.nl/meststoffen/de-samenstelling-van-organische-meststoffen/>
- Poore, J., & Nemecek, T. (2018). *Reducing food's environmental impacts through producers and consumers*. *Science*, *360*(6392), 987–992. <https://doi.org/10.1126/science.aag0216>
- Quantis. (n.d.). *World Food LCA Database*. <https://quantis.com/who-we-guide/our-impact/sustainability-initiatives/wfdb-food/>
- Roches, A., Nemecek, T., Gaillard, G., Plassmann, K., Sim, S., King, H., & Milà i Canals, L. (2010). *MEXALCA: A modular method for the extrapolation of crop LCA*. *The International Journal of Life Cycle Assessment*, *15*(8), 842–854. <https://doi.org/10.1007/s11367-010-0209-y>
- Sanchez-Ortiz, K., Newbold, T., Purvis, A., & De Palma, A. (2019). *Global maps of biodiversity intactness for the year 2005*. *bioRxiv*. <https://doi.org/10.1101/576546>
- Scholes, R.J., & Biggs, R. (2005). *A biodiversity intactness index*. *Nature*, *434*(7029), 45–49. <https://doi.org/10.1038/nature03289>
- [Final not published yet] Weststrate, J., Broekema, R., Vieira, M., Williams, E., Schumacher, L., Hopman, M., Lucherini, D., Bonekamp, Q., Verweij-Novikova, I. Product Environmental Footprint Category Rules for Fruits and Vegetables (2nd Draft). Wageningen, Wageningen Social & Economic Research, Report 2024-047. 128 pp.; 4 fig.; 45 tab
- Zimmerman, C., & Kiss, L. (2017). *Human trafficking and exploitation: A global health concern*. *PLoS medicine*, *14*(11), e1002437.

Appendix 1 Forced labour adjusted Government Response Score method

The national score for Forced Labour consists of four indicators: Estimated population in forced or bonded labour, the vulnerability of labourers to become involved in forced labour (both provided by the Walk Free Foundation), a dummy indicating whether a country ratifies two main social security conventions to protect migrant workers, and an index based on the government response index (Measurement Action Freedom index, or MAF index) also provided by the Walk Free Foundation. This latter index is composed out of approximately 100 dummy variables indicating the action that a national government takes to counter modern slavery for its own inhabitants and in value chains of products that enter the country. The information provided by this index is highly valuable for calculating a correct Forced Labour national score, but also included information that overlaps with other themes (like child labour or illegal prostitution) or that regards the country's action towards forced labour in their international trade instead of within its own boundaries. Therefore, it has been decided to compose an index that excludes the dummies not relevant for this specific theme and scope.

The MAF consists of five milestones, each milestone consist of a few statements on which the dummy indicates whether the country's policy complies with that statement. For the purpose of this project, we 'cherry picked' statements relevant to the theme Forced Labour. We acknowledge that the original MAF index is composed out of many variables that are all carefully weighted against the importance of that variable, based on Walk Free Foundation's extensive knowledge and experience in this topic. Nevertheless, in order to prevent our selection of variables to be messed up as a result of these assigned weights, we decided to only include relevant statements, compose milestone scores based on the average within the milestone, and calculate a score based on the average of the milestone. This results into an equal weight for each milestone, which provides, in our opinion, the optimal 'government response' forced labour indicator, adding to the prevalence of estimated modern slavery in countries, the vulnerability score and the ratification of two main social security conventions to protect migrant workers.

The components of Walk Free Foundation's MAF index can be found [here](#). The components of the index that were selected for the government response indicator used in this project are provided in the table below.

In the table below, the components of Walk Free Foundation's MAF index are provided, along with an indication which dummy variables are selected to be included in our calculation for the government response index. In 2023, the Global Slavery Index updates its dataset dating from 2019. The third column in the table below shows the code number that corresponds to the position of the statement in the 2023 update list.

Milestone	Dummy	Position in 2023 codebook
MILESTONE 1: Survivors of slavery are identified and supported to exit and remain out of modern slavery	Activity M1 1.1.1 National campaigns provide information to members of the public on how to report and identify victims.	1.1.1
	Activity M1 1.1.2. These campaigns are distributed systematically and at regular intervals (as distinct from one-off, isolated).	1.1.2
	Activity M1 2.1.1 There is a reporting mechanism, such as a hotline.	1.2.1
	Activity M1 2.1.2 Reporting mechanism is available for men, women, and children.	1.2.2
	Activity M1 2.1.3 Reporting mechanism is free of charge to access.	1.2.3
	Activity M1 2.1.4 Reporting mechanism operates 24/7.	1.2.4
	Activity M1 2.1.5 The reporting mechanism operates in multiple languages or has capacity to provide immediate access to translators.	1.2.5
	Activity M1 2.2.1 Training on basic legal frameworks and victim identification has been carried out for front-line 'general duties' police.	1.3.1

Milestone	Dummy	Position in 2023 codebook
	Activity M1 2.2.4 NEGATIVE There is evidence that police officers have not identified victims of modern slavery.	1.5.1
	Activity M1 2.3.1 Training on how to identify victims of modern slavery is provided to officials with front-line regulatory bodies likely to be 'first responders.'	1.4.1
	Activity M1 2.3.2 Training on how to identify victims of modern slavery is provided to non-regulatory workers likely to be 'first responders.'	1.4.2
	Activity M1 2.3.3 Training for first responders is delivered systematically and at regular intervals (as distinct from one-off, isolated).	1.4.3
	Activity M1 4.1.1 The government has clear national guidelines on identifying and screening victims for all first responders.	3.1.1
	Activity M1 4.1.2 The guidelines make provision for a category of 'presumed victims' who can be provided with services until a formal determination is made.	3.1.2
	Activity M1 4.1.3 The guidelines clearly set out which organisations have the authority to identify victims of modern slavery.	3.1.3
MILESTONE 2: Criminal justice mechanisms function effectively to prevent modern slavery	Activity M2 1.1.1 Slavery Convention, 1926.	1.1.1
	Activity M2 1.1.10 P029 - Protocol of 2014 to the Forced Labour Convention, 1930.	
	Activity M2 1.1.2 Supplementary Convention on the Abolition of Slavery, the Slave Trade, and Institutions and Practices Similar to Slavery, 1956.	1.1.2
	Activity M2 1.1.4 ILO Abolition of Forced Labour Convention, 1957 (No. 105).	1.3.1
	Activity M2 1.1.5 ILO Domestic Workers Convention, 2011 (No. 189).	1.7.3
	Activity M2 1.2.1 Human trafficking is criminalised.	1.2.2
	Activity M2 1.2.2 Slavery is criminalised.	1.1.3
	Activity M2 1.2.3 Forced labour is criminalised.	1.3.4
	Activity M2 3.1.1 Specialised law enforcement units exist.	3.1.1
	Activity M2 3.1.4 Units have standard operating procedures for modern slavery cases.	Gone
	Activity M2 3.2.1 Training is provided to the judiciary.	3.2.1
	Activity M2 3.2.2 Training is provided to prosecutors.	3.2.2
Activity M2 3.2.4 Training is systematic and recurrent (as distinct from one-off, isolated).	3.2.3	
MILESTONE 3: Coordination occurs at the national level and across borders, and governments are held to account for their response	Activity M3 1.1.1 National coordination body exists involving both government and NGOs.	1.1.1
	Activity M3 1.2.1 A National Action Plan exists with clear indicators and allocation of responsibilities.	1.1.5
	Activity M3 3.1.1 The government is involved in a regional response.	2.1.1
	Activity M3 3.1.3 Agreements exist between the government and countries of origin and/or destination to collaborate on modern slavery issues.	2.1.2
	Activity M3 3.2.6 Agreements exist between countries on labour migration, which provide protection for labour migrants.	2.2.2
MILESTONE 4: Risk factors, such as attitudes, social systems, and institutions that enable modern slavery are addressed	Activity M4 1.1.1 Government facilitates or funds non-prevalence research on modern slavery.	1.1.1
	Activity M4 1.1.2 Government facilitates or funds research on prevalence or estimation studies of modern slavery.	1.1.1 (both)
	Activity M4 1.1.3 Government interventions that aim to address modern slavery are evidence-based.	1.1.2
	Activity M4 1.2.1 Awareness campaigns target specific known risks of modern slavery.	1.2.1
	Activity M4 1.3.2 The government conducts labour inspections in the informal and formal sectors and acts to address exploitative practice.	2.1.1
	Activity M4 1.5.2 Systems are in place to allow asylum seekers to seek protection.	3.1.5
	Activity M4 1.6.5 Labour laws extend to everyone, including migrant workers, domestic workers, and those in the fishing and construction sectors.	2.1.3
Activity M4 1.6.7 NEGATIVE Patterns of abuse of labour migrants are institutionalised, or systematic and unchecked.	Gone	

Milestone	Dummy	Position in 2023 codebook
	Activity M4 1.6.9 NEGATIVE There are laws or policies that prevent or make it difficult for workers to leave abusive employers without risk of loss of visa and deportation and/or security deposits.	2.2.4
	Activity M4 1.8.1 NEGATIVE State-sanctioned forced labour exists.	4.1.1
MILESTONE 5: Government and business stop sourcing goods and services produced by forced labour	Activity M5 1.1.5 There is evidence that the government has taken remedial action where forced labour has been discovered.	1.1.5
	Activity M5 2.1.1 Laws or policies require businesses to report on their actions to implement risk minimisation policies.	2.1.1
	Activity M5 2.1.2 Governments have identified high-risk sectors and have taken action to work with these sectors to eradicate modern slavery.	2.3.1
	Activity M5 2.1.3 Laws or policies allow governments to create a public list of businesses that have been found to tolerate slavery in their supply chains.	2.3.2

Appendix 2 Criteria for data reliability during commodity risk score assessment (standardised literature review)

The literature review is based on the collection of public qualitative data sources mainly, but not exclusively, published in the English language. Only when a lack of reliable data in the English language prohibits the researcher to engage in a meaningful assessment of the commodity risk scores, the search is broadened and takes into account literature that is published in a different language. Mostly in the language of the producing country under study. Translation software makes most of these languages easily accessible to the project team, if the project team is not competent in the language of the publication.

We classify all qualitative data sources into four categories, reflecting the 'reliability' of the source itself. We distinguish between low, medium, good and high quality. Findings on human right risks in sources of good and high quality are stand-alone sources that can be used to benchmark the commodity risk scores. Sources of low and medium reliability always need to be combined with sources from good and high reliability to lead to an assessment if only using two sources. For sources considered to have 'medium reliability' we develop the rule that one additional source needs to be collected to confirm the information in this source if an assessment were to be based on medium reliability sources & expert knowledge alone. Benchmarking the thematic risk based on only low credibility sources is not allowed.

For all sources to be included in the assessment the researcher will assess its credibility before being eligible to be included in the study. The credibility assessment is considered to be an essential skill that all researchers involved in the project possess based on their educational and working background.

Table 42 Reliability levels for different types of qualitative sources

Reliability	Sources
High	Scientific journals/books/conference papers/reports of universities Reports of accredited institutions such as the UN, ILO, OECD, FAO
Good	NGO reports, other reports, incl governmental reports
Medium	Newspapers articles, digital articles, YouTube (depending on source)
Low	LinkedIn, blog, websites, YouTube (depending on source)

Publications older than 10 years will be regarded as 'low quality sources' and therefore cannot be used as stand-alone sources. These publications need to be accompanied with supporting evidence that meet the reliability criteria.

Appendix 3 Dealing with data availability during commodity risk score assessment

In order to do a proper assessment of the commodity risks WUR builds upon its expertise on agricultural production systems and human rights risks in global supply chains. The analysis is not able to account for all country-commodity specific risks due to information/data gaps. However, we can approach the risk by taking a (agricultural) sector-level perspective and building on our knowledge on the risks associated with the commodity (or group of similar commodities) in other producing countries.

When engaging in the assessment of community risk scores we are looking for theme country-commodity specific data in public sources of the highest quality and mostly in the English language. In some cases, this combination is simply not available to us. For those circumstances we developed rules on how to deal with the availability of data in the assessment of commodity specific risks.

Table 43 *Dealing with missing data for commodity risk scores*

Situation	Solution
General rule	If no meaningful commodity risk score can be calculated due to lack of data, we use the commodity-specific national risk scores. If this is not available, we refer to the national risk score. In both cases this is made explicit in the dashboard.
No commodity-specific data available	The researcher uses expert judgment where one combines the information in the commodity-production database on the sector and similar producing countries and combines this with information on production systems, cultivation methods and workforce in the focus country. This can include using information from similar commodity groups in the country or a information from proxy country. The researcher is stimulated to cross check information form other risk themes that might be of relevance for this theme. Valid assessment of commodity risk score is still possible.
No sectoral data available	The researcher can use general information on the commodity and possibly commodity specific national data and combine this with broader knowledge on the Human Rights theme in production country. Valid assessment of commodity risk score is still possible.
No commodity-specific and sectoral data available	No valid assessment for commodity risk score is possible. We refer to the commodity specific national risk score. If this is not available, we refer to the national risk score. In both cases this is made explicit in the dashboard.
No thematic data in relation to the sector	If the assessment of the commodity risk scores relies on country-specific data (e.g., discrimination) no meaningful assessment is possible when there is no thematic data for the sector. Therefore, maintain the commodity-specific national risk score or the national risk score. If the assessment of the theme relies on commodity-specific data (e.g., OHS) the risk can be approached by building upon the commodity-production database and proxy countries.
No country specific data for the commodity/sector and theme	No meaningful assessment is possible. We use the commodity-specific national risk scores. If this is not available, we refer to the national risk score. Both are made explicit in the dashboard.

Appendix 4 Comparison between Anker & Anker and Wage Indicator benchmarks for the calculation of the living income deficit

As mentioned in Section 2.4.7, we tried using benchmarks using the Anker & Anker methodology, but this led to biases in the living income deficits. As can be seen in the image below, the Wage Indicator benchmarks can be higher than the Anker & Anker benchmarks, which is likely due the Anker & Anker benchmarks being for a very specific population, who have lower incomes. Even though this may better reflect the realities of the households we are interested in, it does not match well with the income data that we are using, which is also only corrected for regional differences, but not for a specific type of household. As can be seen in the Cameroon example below, taking the Anker & Anker benchmark here would lead to differences in the final living income deficit that are hard to explain to the user of the dashboard (i.e. Cameroon having lower areas compared to Ecuador and Brazil).

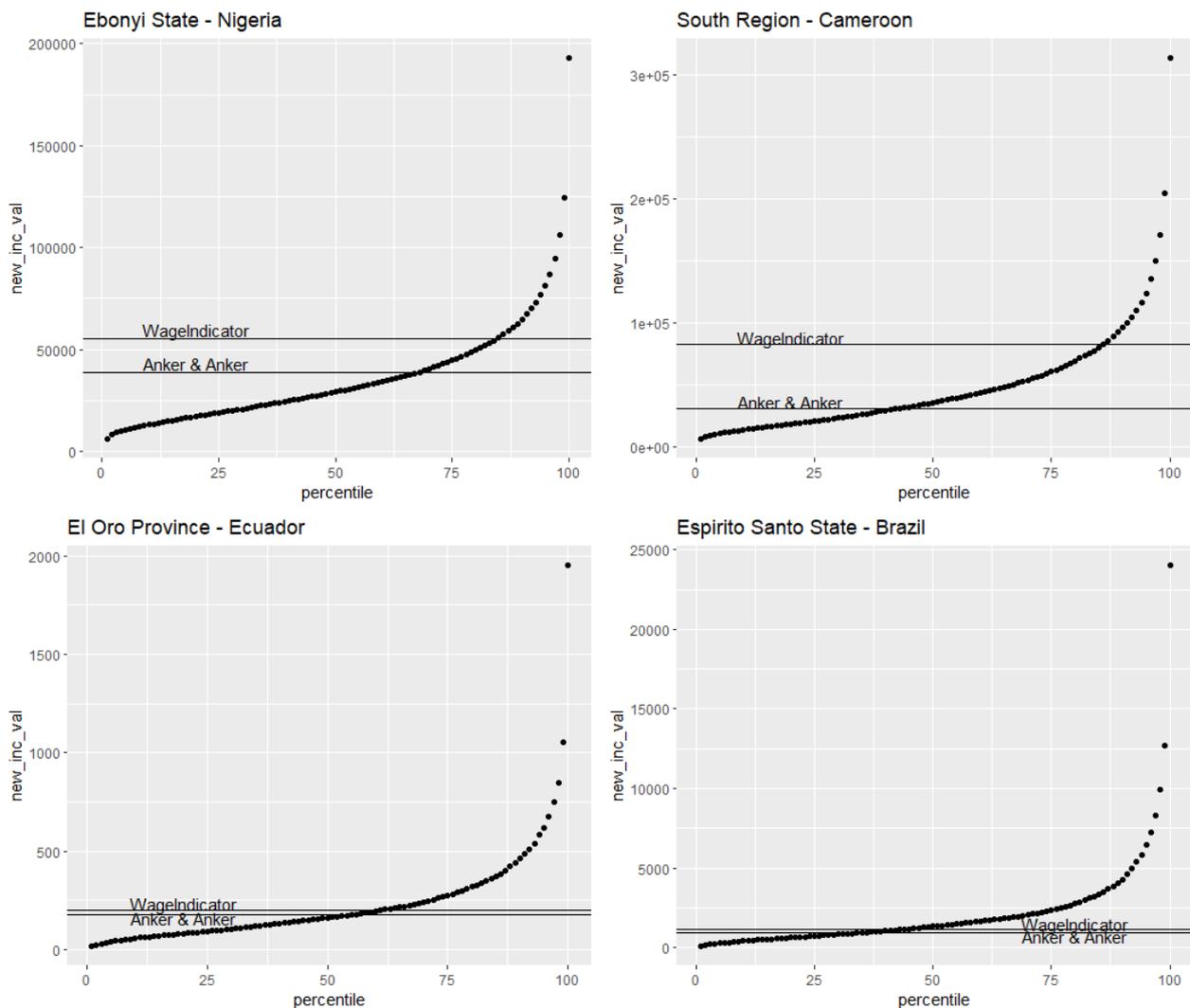


Figure 10 ` Comparing WageIndicator and Anker & Anker benchmarks

Appendix 5 Selected variables for 'Workplace discrimination (WPC)' and 'Social institutions and gender discrimination (GID-DB)' indicators (Discrimination theme)

The table below presents an overview of selected variables from indexes and surveys related to indicators under the theme of Discrimination.

Legal protection from workplace discrimination (WPC) ⁸⁸	Indicator value levels	WUR indicator
Is discrimination in hiring or recruitment prohibited on the basis of gender?	<ul style="list-style-type: none"> • No prohibition • General prohibition of discrimination in hiring or recruitment • Broad prohibition of workplace discrimination based on gender • Yes, gender-specific prohibition 	Each of the variable levels was benchmarked to fit the 0-5 risk scale. Afterwards, the mean of all of the selected indicators was taken to arrive at the final national indicator risk level.
Is discrimination in hiring or recruitment prohibited on the basis of disability?	<ul style="list-style-type: none"> • No prohibition • General prohibition of discrimination in hiring or recruitment • Broad prohibition of workplace discrimination based on disability • Yes, disability specific prohibition 	
Is discrimination in hiring or recruitment prohibited on the basis of religion?	<ul style="list-style-type: none"> • No prohibition • General prohibition of discrimination in hiring or recruitment • Broad prohibition of workplace discrimination based on religion • Yes, religion -specific prohibition 	
Is discrimination in hiring or recruitment prohibited on the basis of race/ethnicity?	<ul style="list-style-type: none"> • No prohibition • General prohibition of discrimination in hiring or recruitment • Broad prohibition of workplace discrimination based on race/ethnicity • Yes, race/ethnicity -specific prohibition 	
Is discrimination in hiring or recruitment prohibited on the basis of political affiliation?	<ul style="list-style-type: none"> • No prohibition • General prohibition of discrimination in hiring or recruitment • Broad prohibition of workplace discrimination based on political affiliation • Yes, political affiliation -specific prohibition 	
Is discrimination in hiring or recruitment prohibited on the basis of social class?	<ul style="list-style-type: none"> • No prohibition • General prohibition of discrimination in hiring or recruitment • Broad prohibition of workplace discrimination based on social class • Yes, social class -specific prohibition 	
Is discrimination in hiring or recruitment prohibited on the basis of age?	<ul style="list-style-type: none"> • No prohibition • General prohibition of discrimination in hiring or recruitment • Broad prohibition of workplace discrimination based on age • Yes, age -specific prohibition 	

⁸⁸ <https://www.worldpolicycenter.org/topics/equal-rights-and-discrimination/workplace-discrimination/policies>

Legal protection from workplace discrimination (WPC) ⁸⁸	Indicator value levels	WUR indicator
Is discrimination in hiring or recruitment prohibited on the basis of marital status?	<ul style="list-style-type: none"> • No prohibition • General prohibition of discrimination in hiring or recruitment • Broad prohibition of workplace discrimination based on marital status • Yes, marital status -specific prohibition 	
Is discrimination in hiring or recruitment prohibited on the basis of migrant status?	<ul style="list-style-type: none"> • No prohibition • General prohibition of discrimination in hiring or recruitment • Broad prohibition of workplace discrimination based on migrant status • Yes, migrant status -specific prohibition 	
Is discrimination in hiring or recruitment prohibited on the basis of foreign national origin?	<ul style="list-style-type: none"> • No prohibition • General prohibition of discrimination in hiring or recruitment • Broad prohibition of workplace discrimination based on foreign national origin • Yes, foreign national origin -specific prohibition 	
Is discrimination in hiring or recruitment prohibited on the basis of maternal status?	<ul style="list-style-type: none"> • No prohibition • General prohibition of discrimination in hiring or recruitment • Broad prohibition of workplace discrimination based on maternal status • Yes, maternal status -specific prohibition 	
Is discrimination in hiring or recruitment prohibited on the basis of paternal status?	<ul style="list-style-type: none"> • No prohibition • General prohibition of discrimination in hiring or recruitment • Broad prohibition of workplace discrimination based on paternal status • Yes, paternal status -specific prohibition 	
Is discrimination in hiring or recruitment prohibited on the basis of pregnancy?	<ul style="list-style-type: none"> • No prohibition • General prohibition of discrimination in hiring or recruitment • Broad prohibition of workplace discrimination based on pregnancy status • Yes, pregnancy status-specific prohibition 	
Is discrimination in promotions and/or demotions prohibited on the basis of gender?	<ul style="list-style-type: none"> • No prohibition • Broad prohibition of workplace discrimination based on gender • Yes, gender-specific prohibition 	
Is discrimination in promotions and/or demotions prohibited on the basis of disability?	<ul style="list-style-type: none"> • No prohibition • General prohibition of discrimination in promotions and/or demotions • Broad prohibition of workplace discrimination based on disability • Yes, disability -specific prohibition 	
Is discrimination in promotions and/or demotions prohibited on the basis of religion?	<ul style="list-style-type: none"> • No prohibition • Broad prohibition of workplace discrimination based on religion • Yes, religion -specific prohibition 	
Is discrimination in promotions and/or demotions prohibited on the basis of race/ethnicity?	<ul style="list-style-type: none"> • No prohibition • Broad prohibition of workplace discrimination based on race/ethnicity • Yes, race/ethnicity -specific prohibition 	
Is discrimination in promotions and/or demotions prohibited on the basis of political affiliation?	<ul style="list-style-type: none"> • No prohibition • General prohibition of discrimination in promotions and/or demotions • Broad prohibition of workplace discrimination based on political affiliation • Yes, political affiliation -specific prohibition 	
Is discrimination in promotions and/or demotions prohibited on the basis of social class?	<ul style="list-style-type: none"> • No prohibition • General prohibition of discrimination in promotions and/or demotions • Broad prohibition of workplace discrimination based on social class • Yes, social class -specific prohibition 	

Legal protection from workplace discrimination (WPC) ⁸⁸	Indicator value levels	WUR indicator
Is discrimination in promotions and/or demotions prohibited on the basis of age?	<ul style="list-style-type: none"> • No prohibition • General prohibition of discrimination in promotions and/or demotions • Broad prohibition of workplace discrimination based on age • Yes, age -specific prohibition 	
Is discrimination in promotions and/or demotions prohibited on the basis of marital status?	<ul style="list-style-type: none"> • No prohibition • General prohibition of discrimination in promotions and/or demotions • Broad prohibition of workplace discrimination based on marital status • Yes, marital status -specific prohibition 	
Is discrimination in promotions and/or demotions prohibited on the basis of migrant status?	<ul style="list-style-type: none"> • No prohibition • General prohibition of discrimination in promotions and/or demotions • Broad prohibition of workplace discrimination based on migrant status • Yes, migrant status -specific prohibition 	
Is discrimination in promotions and/or demotions prohibited on the basis of foreign national origin?	<ul style="list-style-type: none"> • No prohibition • General prohibition of discrimination in promotions and/or demotions • Broad prohibition of workplace discrimination based on foreign national origin • Yes, foreign national origin -specific prohibition 	
Is discrimination in promotions and/or demotions prohibited on the basis of maternal status?	<ul style="list-style-type: none"> • No prohibition • General prohibition of discrimination in promotions and/or demotions • Broad prohibition of workplace discrimination based on maternal status • Yes, maternal status -specific prohibition 	
Is discrimination in promotions and/or demotions prohibited on the basis of paternal status?	<ul style="list-style-type: none"> • No prohibition • General prohibition of discrimination in promotions and/or demotions • Broad prohibition of workplace discrimination based on paternal status • Yes, paternal status -specific prohibition 	
Is discrimination in promotions and/or demotions prohibited on the basis of pregnancy?	<ul style="list-style-type: none"> • No prohibition • General prohibition of discrimination in promotions and/or demotions • Broad prohibition of workplace discrimination based on pregnancy status • Yes, pregnancy status -specific prohibition 	
Is discrimination in access to employer-provided training prohibited on the basis of race/ethnicity?	<ul style="list-style-type: none"> • No prohibition • Broad prohibition of workplace discrimination based on race/ethnicity • Yes, race/ethnicity -specific prohibition 	
Is discrimination in access to employer-provided training prohibited on the basis of gender?	<ul style="list-style-type: none"> • No prohibition • Broad prohibition of workplace discrimination based on gender • Yes, gender -specific prohibition 	
Is discrimination in access to employer-provided training prohibited on the basis of marital status?	<ul style="list-style-type: none"> • No prohibition • General prohibition of discrimination in training • Broad prohibition of workplace discrimination based on marital status • Yes, marital status -specific prohibition 	
Is discrimination in access to employer-provided training prohibited on the basis of pregnancy?	<ul style="list-style-type: none"> • No prohibition • General prohibition of discrimination in training • Broad prohibition of workplace discrimination based on pregnancy • Yes, pregnancy -specific prohibition 	
Is discrimination in access to employer-provided training prohibited on the basis of paternal status?	<ul style="list-style-type: none"> • No prohibition • General prohibition of discrimination in training • Broad prohibition of workplace discrimination based on paternal status • Yes, paternal status -specific prohibition 	

Legal protection from workplace discrimination (WPC) ⁸⁸	Indicator value levels	WUR indicator
Is discrimination in access to employer-provided training prohibited on the basis of age?	<ul style="list-style-type: none"> • No prohibition • General prohibition of discrimination in training • Broad prohibition of workplace discrimination based on age • Yes, age -specific prohibition 	
Is discrimination in access to employer-provided training prohibited on the basis of religion?	<ul style="list-style-type: none"> • No prohibition • Broad prohibition of workplace discrimination based on religion • Yes, religion -specific prohibition 	
Is discrimination in access to employer-provided training prohibited on the basis of social class?	<ul style="list-style-type: none"> • No prohibition • General prohibition of discrimination in training • Broad prohibition of workplace discrimination based on social class • Yes, social class -specific prohibition 	
Is discrimination in access to employer-provided training prohibited on the basis of maternal status?	<ul style="list-style-type: none"> • No prohibition • General prohibition of discrimination in training • Broad prohibition of workplace discrimination based on maternal status • Yes, maternal status -specific prohibition 	
Is discrimination in access to employer-provided training prohibited on the basis of disability?	<ul style="list-style-type: none"> • No prohibition • General prohibition of discrimination in training • Broad prohibition of workplace discrimination based on disability • Yes, disability -specific prohibition 	
Is discrimination in access to employer-provided training prohibited on the basis of political affiliation?	<ul style="list-style-type: none"> • No prohibition • General prohibition of discrimination in training • Broad prohibition of workplace discrimination based on political affiliation • Yes, political affiliation -specific prohibition 	
Is discrimination in access to employer-provided training prohibited on the basis of foreign national origin?	<ul style="list-style-type: none"> • No prohibition • General prohibition of discrimination in training • Broad prohibition of workplace discrimination based on foreign national origin • Yes, foreign national origin -specific prohibition 	
Is discrimination in access to employer-provided training prohibited on the basis of migrant status?	<ul style="list-style-type: none"> • No prohibition • General prohibition of discrimination in training • Broad prohibition of workplace discrimination based on migrant status • Yes, migrant status -specific prohibition 	
Is discrimination in terminations prohibited on the basis of gender?	<ul style="list-style-type: none"> • No prohibition • General prohibition of discrimination in terminations • Broad prohibition of workplace discrimination based on gender • Yes, gender -specific prohibition 	
Is discrimination in terminations prohibited on the basis of disability?	<ul style="list-style-type: none"> • No prohibition • General prohibition of discrimination in terminations • Broad prohibition of workplace discrimination based on disability • Yes, disability -specific prohibition 	
Is discrimination in terminations prohibited on the basis of religion?	<ul style="list-style-type: none"> • No prohibition • General prohibition of discrimination in terminations • Broad prohibition of workplace discrimination based on religion • Yes, religion -specific prohibition 	

Legal protection from workplace discrimination (WPC) ⁸⁸	Indicator value levels	WUR indicator
Is discrimination in terminations prohibited on the basis of race/ethnicity?	<ul style="list-style-type: none"> • No prohibition • General prohibition of discrimination in terminations • Broad prohibition of workplace discrimination based on race/ethnicity • Yes, race/ethnicity -specific prohibition 	
Is discrimination in terminations prohibited on the basis of political affiliation?	<ul style="list-style-type: none"> • No prohibition • General prohibition of discrimination in terminations • Broad prohibition of workplace discrimination based on political affiliation • Yes, political affiliation -specific prohibition 	
Is discrimination in terminations prohibited on the basis of social class?	<ul style="list-style-type: none"> • No prohibition • General prohibition of discrimination in terminations • Broad prohibition of workplace discrimination based on social class • Yes, social class -specific prohibition 	
Is discrimination in terminations prohibited on the basis of age?	<ul style="list-style-type: none"> • No prohibition • General prohibition of discrimination in terminations • Broad prohibition of workplace discrimination based on age • Yes, age -specific prohibition 	
Is discrimination in terminations prohibited on the basis of marital status?	<ul style="list-style-type: none"> • No prohibition • General prohibition of discrimination in terminations • Broad prohibition of workplace discrimination based on marital status • Yes, marital status -specific prohibition 	
Is discrimination in terminations prohibited on the basis of migrant status?	<ul style="list-style-type: none"> • No prohibition • General prohibition of discrimination in terminations • Broad prohibition of workplace discrimination based on migrant status • Yes, migrant status -specific prohibition 	
Is discrimination in terminations prohibited on the basis of foreign national origin?	<ul style="list-style-type: none"> • No prohibition • General prohibition of discrimination in terminations • Broad prohibition of workplace discrimination based on foreign national origin • Yes, foreign national origin -specific prohibition 	
Is discrimination in terminations prohibited on the basis of maternal status?	<ul style="list-style-type: none"> • No prohibition • General prohibition of discrimination in terminations • Broad prohibition of workplace discrimination based on maternal status • Yes, maternal status -specific prohibition 	
Is discrimination in terminations prohibited on the basis of paternal status?	<ul style="list-style-type: none"> • No prohibition • General prohibition of discrimination in terminations • Broad prohibition of workplace discrimination based on paternal status • Yes, paternal status -specific prohibition 	
Is discrimination in terminations prohibited on the basis of pregnancy status?	<ul style="list-style-type: none"> • No prohibition • General prohibition of discrimination in terminations • Broad prohibition of workplace discrimination based on pregnancy status • Yes, pregnancy status -specific prohibition 	
Is equal pay guaranteed to workers based on gender?	<ul style="list-style-type: none"> • No guarantee • General guarantee of equal pay • Broad prohibition of workplace discrimination based on gender • Guarantees equal pay for equal work based on gender • Guarantees equal pay for work of equal value based on gender 	

Legal protection from workplace discrimination (WPC) ⁸⁸	Indicator value levels	WUR indicator
Is equal pay guaranteed to workers based on disability?	<ul style="list-style-type: none"> • No guarantee • General guarantee of equal pay • Broad prohibition of workplace discrimination based on disability • Guarantees equal pay for equal work based on disability • Guarantees equal pay for work of equal value based on disability 	
Is equal pay guaranteed to workers based on religion?	<ul style="list-style-type: none"> • No guarantee • General guarantee of equal pay • Broad prohibition of workplace discrimination based on religion • Guarantees equal pay for equal work based on religion • Guarantees equal pay for work of value based on religion 	
Is equal pay guaranteed to workers based on race/ethnicity?	<ul style="list-style-type: none"> • No guarantee • General guarantee of equal pay • Broad prohibition of workplace discrimination based on race/ethnicity • Guarantees equal pay for equal work based on race/ethnicity • Guarantees equal pay for work of equal value based on race/ethnicity 	
Is equal pay guaranteed to workers based on political affiliation?	<ul style="list-style-type: none"> • No guarantee • General guarantee of equal pay • Broad prohibition of workplace discrimination based on political affiliation • Guarantees equal pay for equal work based on political affiliation • Guarantees equal pay for work of equal value based on political affiliation 	
Is equal pay guaranteed to workers based on social class?	<ul style="list-style-type: none"> • No guarantee • General guarantee of equal pay • Broad prohibition of workplace discrimination based on social class • Guarantees equal pay for equal work based on social class • Guarantees equal pay for work of equal value based on social class 	
Is equal pay guaranteed to workers based on age?	<ul style="list-style-type: none"> • No guarantee • General guarantee of equal pay • Broad prohibition of workplace discrimination based on age • Guarantees equal pay for equal work based on age • Guarantees equal pay for work of equal value based on age 	
Is equal pay guaranteed to workers based on marital status?	<ul style="list-style-type: none"> • No guarantee • General guarantee of equal pay • Broad prohibition of workplace discrimination based on marital status • Guarantees equal pay for equal work based on marital status • Guarantees equal pay for work of equal value based on marital status 	
Is equal pay guaranteed to workers based on migrant status?	<ul style="list-style-type: none"> • No guarantee • General guarantee of equal pay • Broad prohibition of workplace discrimination based on migrant status • Guarantees equal pay for equal work based on migrant status • Guarantees equal pay for work of equal value based on migrant status 	

Legal protection from workplace discrimination (WPC) ⁸⁸	Indicator value levels	WUR indicator
Is equal pay guaranteed to workers based on foreign national origin?	<ul style="list-style-type: none"> • No guarantee • General guarantee of equal pay • Broad prohibition of workplace discrimination based on foreign national origin • Guarantees equal pay for equal work based on foreign national origin • Guarantees equal pay for work of equal value based on foreign national origin 	
Is equal pay guaranteed to workers based on maternal status?	<ul style="list-style-type: none"> • No guarantee • General guarantee of equal pay • Broad prohibition of workplace discrimination based on maternal status • Guarantees equal pay for equal work based on maternal status • Guarantees equal pay for work of equal value based on maternal status 	
Is equal pay guaranteed to workers based on paternal status?	<ul style="list-style-type: none"> • No guarantee • General guarantee of equal pay • Broad prohibition of workplace discrimination based on paternal status • Guarantees equal pay for equal work based on paternal status • Guarantees equal pay for work of equal value based on paternal status 	
Is equal pay guaranteed to workers based on pregnancy status?	<ul style="list-style-type: none"> • No guarantee • General guarantee of equal pay • Broad prohibition of workplace discrimination based on pregnancy status • Guarantees equal pay for equal work based on pregnancy status • Guarantees equal pay for work of equal value based on pregnancy status 	
Is indirect discrimination prohibited at work on the basis of gender?	<ul style="list-style-type: none"> • No indirect discrimination provisions • General prohibition of indirect discrimination • Yes, gender-specific prohibition 	
Is indirect discrimination prohibited at work on the basis of disability?	<ul style="list-style-type: none"> • No indirect discrimination provisions • General prohibition of indirect discrimination • Yes, disability -specific prohibition 	
Is indirect discrimination prohibited at work on the basis of religion?	<ul style="list-style-type: none"> • No indirect discrimination provisions • General prohibition of indirect discrimination • Yes, religion -specific prohibition 	
Is indirect discrimination prohibited at work on the basis of race/ethnicity?	<ul style="list-style-type: none"> • No indirect discrimination provisions • General prohibition of indirect discrimination • Yes, race/ethnicity -specific prohibition 	
Is indirect discrimination prohibited at work on the basis of political affiliation?	<ul style="list-style-type: none"> • No indirect discrimination provisions • General prohibition of indirect discrimination • Yes, political affiliation -specific prohibition 	
Is indirect discrimination prohibited at work on the basis of social class?	<ul style="list-style-type: none"> • No indirect discrimination provisions • General prohibition of indirect discrimination • Yes, social class -specific prohibition 	
Is indirect discrimination prohibited at work on the basis of age?	<ul style="list-style-type: none"> • No indirect discrimination provisions • General prohibition of indirect discrimination • Yes, age -specific prohibition 	
Is indirect discrimination prohibited at work on the basis of marital status?	<ul style="list-style-type: none"> • No indirect discrimination provisions • General prohibition of indirect discrimination • Yes, marital status -specific prohibition 	
Is indirect discrimination prohibited at work on the basis of migrant status?	<ul style="list-style-type: none"> • No indirect discrimination provisions • General prohibition of indirect discrimination • Yes, migrant status -specific prohibition 	
Is indirect discrimination prohibited at work on the basis of foreign national origin?	<ul style="list-style-type: none"> • No indirect discrimination provisions • General prohibition of indirect discrimination • Yes, foreign national origin -specific prohibition 	
Is indirect discrimination prohibited at work on the basis of maternal status?	<ul style="list-style-type: none"> • No indirect discrimination provisions • General prohibition of indirect discrimination • Yes, maternal status -specific prohibition 	

Legal protection from workplace discrimination (WPC) ⁸⁸	Indicator value levels	WUR indicator
Is indirect discrimination prohibited at work on the basis of paternal status?	<ul style="list-style-type: none"> • No indirect discrimination provisions • General prohibition of indirect discrimination • Yes, paternal status -specific prohibition 	
Is indirect discrimination prohibited at work on the basis of pregnancy status?	<ul style="list-style-type: none"> • No indirect discrimination provisions • General prohibition of indirect discrimination • Yes, pregnancy status -specific prohibition 	
Is retaliation prohibited for participating in workplace investigations of discrimination on the basis of gender?	<ul style="list-style-type: none"> • No explicit prohibition of workplace discrimination based on gender • No prohibition of retaliation • Only individuals who report • Explicit coverage for workers participating in investigation • Coverage not specified 	
Is retaliation prohibited for participating in workplace investigations of discrimination on the basis of religion?	<ul style="list-style-type: none"> • No explicit prohibition of workplace discrimination based on religion • No prohibition of retaliation • Only individuals who report • Explicit coverage for workers participating in investigation • Coverage not specified 	
Is retaliation prohibited for participating in workplace investigations of discrimination on the basis of race/ethnicity?	<ul style="list-style-type: none"> • No explicit prohibition of workplace discrimination based on race/ethnicity • No prohibition of retaliation • Only individuals who report • Explicit coverage for workers participating in investigation • Coverage not specified 	
Is retaliation prohibited for participating in workplace investigations of discrimination on the basis of political affiliation?	<ul style="list-style-type: none"> • No explicit prohibition of workplace discrimination based on political affiliation • No prohibition of retaliation • Only individuals who report • Explicit coverage for workers participating in investigation • Coverage not specified 	
Is retaliation prohibited for participating in workplace investigations of discrimination on the basis of social class?	<ul style="list-style-type: none"> • No explicit prohibition of workplace discrimination based on social class • No prohibition of retaliation • Only individuals who report • Explicit coverage for workers participating in investigation • Coverage not specified 	
Is retaliation prohibited for participating in workplace investigations of discrimination on the basis of age?	<ul style="list-style-type: none"> • No explicit prohibition of workplace discrimination based on age • No prohibition of retaliation • Only individuals who report • Explicit coverage for workers participating in investigation • Coverage not specified 	
Is retaliation prohibited for participating in workplace investigations of discrimination on the basis of marital status?	<ul style="list-style-type: none"> • No explicit prohibition of workplace discrimination based on marital status • No prohibition of retaliation • Only individuals who report • Explicit coverage for workers participating in investigation • Coverage not specified 	
Is retaliation prohibited for participating in workplace investigations of discrimination on the basis of migrant status?	<ul style="list-style-type: none"> • No explicit prohibition of workplace discrimination based on migrant status • No prohibition of retaliation • Only individuals who report • Explicit coverage for workers participating in investigation • Coverage not specified 	
Is retaliation prohibited for participating in workplace investigations of discrimination on the basis of foreign national origin?	<ul style="list-style-type: none"> • No explicit prohibition of workplace discrimination based on foreign national origin • No prohibition of retaliation • Only individuals who report • Explicit coverage for workers participating in investigation 	

Legal protection from workplace discrimination (WPC) ⁸⁸	Indicator value levels	WUR indicator
Is retaliation prohibited for participating in workplace investigations of discrimination on the basis of pregnancy status?	<ul style="list-style-type: none"> • No explicit prohibition of workplace discrimination based on pregnancy status • No prohibition of retaliation • Only individuals who report • Explicit coverage for workers participating in investigation • Coverage not specified 	
Is retaliation prohibited for participating in workplace investigations of discrimination on the basis of maternal status?	<ul style="list-style-type: none"> • No explicit prohibition of workplace discrimination based on maternal status • No prohibition of retaliation • Only individuals who report • Explicit coverage for workers participating in investigation • Coverage not specified 	
Is retaliation prohibited for participating in workplace investigations of discrimination on the basis of paternal status?	<ul style="list-style-type: none"> • No explicit prohibition of workplace discrimination based on paternal status • No prohibition of retaliation • Only individuals who report • Explicit coverage for workers participating in investigation • Coverage not specified 	

Gender, Institutions and Development Database (GID-DB) ⁸⁹	Variable value	WUR indicator
Restricted civil liberties: Gender gap in population's confidence in the judicial system and courts	Share of women among the total number of persons declaring not having confidence in the judicial system and courts of their country	Each of the variable levels was benchmarked to fit the 0-5 risk scale. Afterwards, the mean of all of the selected indicators was taken to arrive at the final national indicator risk level.
Restricted access to productive and financial assets: Gender gap in managerial positions	Share of women among managers	
Restricted access to productive and financial assets: Attitudes on women's right to a job	Percentage of the population aged 18 years and above agreeing or strongly agreeing that 'when jobs are scarce, men should have more right to a job than women.'	
Restricted access to productive and financial assets: Gender gap in land ownership	Share of women in the total number of land holders	
Restricted access to productive and financial assets: Gender gap in bank account ownership	Share of women in the total number of people aged 15 and above who have a bank account at a financial institution (by themselves or together with someone else)	
Legal discrimination on inheritance	Score 0 (no discrimination) -100 (absolute discrimination)	

⁸⁹ [https://data-explorer.oecd.org/vis?df\[ds\]=DisseminateFinalDMZ&df\[id\]=DSD_GID%40DF_GID_2023&df\[ag\]=OECD.DEV.NPG&dq=.....&lom=LASTNPERIODS&lo=5&to\[TIME_PERIOD\]=false](https://data-explorer.oecd.org/vis?df[ds]=DisseminateFinalDMZ&df[id]=DSD_GID%40DF_GID_2023&df[ag]=OECD.DEV.NPG&dq=.....&lom=LASTNPERIODS&lo=5&to[TIME_PERIOD]=false)

Appendix 6 Selected variables for 'Legal protection from (sexual) harassment and violence (WPC)' & 'Lloyd's register selected indicators on occupational violence' (Violence & harassment theme)

The table below presents an overview of selected variables from indexes and surveys related to indicators under the theme of Violence & harassment.

Legal protection from (sexual) harassment and violence (WPC) ⁹⁰	Indicator value levels	WUR indicator
Is sexual harassment explicitly prohibited in the workplace?	<ul style="list-style-type: none"> • No prohibition • Not prohibited, but at least some protection • Only harassment of women • Yes, for both men and women 	Each of the variable levels was benchmarked to fit the 0-5 risk scale. Afterwards, the mean of all of the selected indicators was taken to arrive at the final national indicator risk level.
Is sexual harassment by coworkers explicitly prohibited?	<ul style="list-style-type: none"> • No prohibition • Not prohibited, but at least some protection • Only harassment of women • Yes, for both men and women 	
Is sexual harassment by customers explicitly prohibited?	<ul style="list-style-type: none"> • No prohibition • Not prohibited, but at least some protection • Only harassment of women • Yes, for both men and women 	
Is sexual harassment by contractors or third parties explicitly prohibited?	<ul style="list-style-type: none"> • No prohibition • Not prohibited, but at least some protection • Only harassment of women • Yes, for both men and women 	
Can employers be held legally responsible for sexual harassment at work?	<ul style="list-style-type: none"> • No prohibition of workplace sexual harassment • No explicit legal responsibility • Employers can be held legally responsible 	
Is retaliation prohibited for participating in workplace investigations of sexual harassment?	<ul style="list-style-type: none"> • No prohibition of workplace sexual harassment • No prohibition of retaliation • Only individuals who report • Explicit coverage for workers participating in the investigation • Coverage not specified 	
Does legislation explicitly prohibit discriminatory workplace harassment on the basis of disability?	<ul style="list-style-type: none"> • No prohibition • General prohibition of harassment • Broad prohibition of workplace discrimination based on disability • Yes, disability-specific prohibition 	
Does legislation explicitly prohibit discriminatory workplace harassment on the basis of religion?	<ul style="list-style-type: none"> • No prohibition • General prohibition of harassment • Broad prohibition of workplace discrimination based on religion • Yes, religion-specific prohibition 	

⁹⁰ <https://www.worldpolicycenter.org/events-launches/preventing-workplace-discrimination-and-sexual-harassment>

Legal protection from (sexual) harassment and violence (WPC) ⁹⁰	Indicator value levels	WUR indicator
Does legislation explicitly prohibit discriminatory workplace harassment on the basis of race/ethnicity?	<ul style="list-style-type: none"> • No prohibition • General prohibition of harassment • Broad prohibition of workplace discrimination based on race/ethnicity • Yes, race/ethnicity-specific prohibition 	
Does legislation explicitly prohibit discriminatory workplace harassment on the basis of political affiliation?	<ul style="list-style-type: none"> • No prohibition • General prohibition of harassment • Broad prohibition of workplace discrimination based on political affiliation • Yes, political affiliation -specific prohibition 	
Does legislation explicitly prohibit discriminatory workplace harassment on the basis of social class?	<ul style="list-style-type: none"> • No prohibition • General prohibition of harassment • Broad prohibition of workplace discrimination based on social class • Yes, social class-specific prohibition 	
Does legislation explicitly prohibit discriminatory workplace harassment on the basis of age?	<ul style="list-style-type: none"> • No prohibition • General prohibition of harassment • Broad prohibition of workplace discrimination based on age • Guaranteed in separate legislation • Yes, age -specific prohibition 	
Does legislation explicitly prohibit discriminatory workplace harassment on the basis of marital status?	<ul style="list-style-type: none"> • No prohibition • General prohibition of harassment • Broad prohibition of workplace discrimination based on marital status • Yes, marital status -specific prohibition 	
Does legislation explicitly prohibit discriminatory workplace harassment on the basis of migrant status?	<ul style="list-style-type: none"> • No prohibition • General prohibition of harassment • Broad prohibition of workplace discrimination based on migrant status • Yes, migrant status -specific prohibition 	
Does legislation explicitly prohibit discriminatory workplace harassment on the basis of foreign national origin?	<ul style="list-style-type: none"> • No prohibition • General prohibition of harassment • Broad prohibition of workplace discrimination based on foreign national origin • Yes, foreign national origin -specific prohibition 	
Does legislation explicitly prohibit discriminatory workplace harassment on the basis of maternal status?	<ul style="list-style-type: none"> • No prohibition • General prohibition of harassment • Broad prohibition of workplace discrimination based on maternal status • Yes, maternal status -specific prohibition 	
Does legislation explicitly prohibit discriminatory workplace harassment on the basis of paternal status?	<ul style="list-style-type: none"> • No prohibition • General prohibition of harassment • Broad prohibition of workplace discrimination based on paternal status • Yes, paternal status -specific prohibition 	
Does legislation explicitly prohibit discriminatory workplace harassment on the basis of pregnancy?	<ul style="list-style-type: none"> • No prohibition • General prohibition of harassment • Broad prohibition of workplace discrimination based on pregnancy status • Yes, pregnancy status-specific prohibition 	

Lloyd's register ⁹¹ selected indicators on occupational violence	Variable value	WUR indicator
Is physical harassment or violence a source of risk to your personal safety?	Yes==1 No==0	The final indicator is a binary variable, where a value of 1 is assigned if the respondent answers 'Yes' to at least one of the two question in the first column. Using this information, we calculate the proportion of respondents in each country who have experienced or witnessed harassment and/or violence in the workplace. This value is then benchmarked to fit the 0-5 risk level scale.
Have you or has anyone you work with experienced injury or harm from physical harassment or violence?	Yes==1 No==0	

⁹¹ https://www.ilo.org/global/publications/WCMS_863095/lang--en/index.htm

Appendix 7 Data sources environmental risks (spatial themes)

The data sources used for the different themes are described in the table below. For deforestation, an alternative data source would have been the integrated deforestation alerts from global forest watch,⁹² but we decided not to use it as it is only available for (sub-)tropical areas, which would pose problems for many non-tropical commodities.

Table 44 Data sources used for spatial risk scores

Theme	Name	Description	Reference
General	MAPSPAM Crop Areas	The 2020 SPAM (Spatial Production Allocation Model) products, encompassing crop area, yield, and production at a 5-minute grid resolution. Employing a diverse range of inputs, IFPRI's Spatial Production Allocation Model (SPAM) utilises a cross-entropy method to generate plausible estimations of crop distribution within disaggregated units. By transitioning data from broader units like countries and sub-national provinces to more granular units such as grid cells, SPAM unveils spatial patterns of crop performance, forming a global grid-scape where geography intersects with agricultural production systems.	https://mapspam.info/ International Food Policy Research Institute (IFPRI), 2024, 'Global Spatially-Disaggregated Crop Production Statistics Data for 2020 Version 1.0', https://doi.org/10.7910/DVN/SWPENT , Harvard Dataverse, V3
General	GADM administrative zones	GADM Code of LEV1 (ISO-1/HASC1)	https://gadm.org/
Deforestation	Intact Forest Landscapes	Identifies the world's last remaining unfragmented forest landscapes, large enough to retain all native biodiversity and showing no signs of human alteration as of the year 2020. This layer also shows the reduction in the extent of Intact Forest Landscapes from 2000 to 2020.	Potapov, P., M.C. Hansen, L. Laestadius, S. Turubanova, A. Yaroshenko, C. Thies, W. Smith, I. Zhuravleva, A. Komarova, S. Minnemeyer, and E. Espipova. 2017. 'The last frontiers of wilderness: Tracking loss of intact forest landscapes from 2000 to 2013.' <i>Science Advances</i> 3: e1600821. https://intactforests.org/data.ifl.html
	Protected areas Strictly protected areas (IUCN IA/B,II)	Displays areas that are legally protected according to various designations (e.g., national parks, state reserves, and wildlife reserves) and managed to achieve conservation objectives	IUCN and UNEP-WCMC (2022), The World Database on Protected Areas (WDPA) [On-line], Cambridge, UK: UNEP-WCMC. Available at: https://www.protectedplanet.net/
	Tree cover loss (annual, 30m, global, Hansen/UMD/Google/USGS/NASA)	In this data set, 'tree cover' is defined as all vegetation greater than 5 meters in height, and may take the form of natural forests or plantations across a range of canopy densities. 'Loss' indicates the removal or mortality of tree cover and can be due to a variety of factors, including mechanical harvesting, fire, disease, or storm damage. As such, 'loss' does not equate to deforestation.	Hansen, M.C., P.V. Potapov, R. Moore, M. Hancher, S.A. Turubanova, A. Tyukavina, D. Thau, S.V. Stehman, S.J. Goetz, T.R. Loveland, A. Kommareddy, A. Egorov, L. Chini, C. O. Justice, and J.R.G. Townshend. 2013. 'High-Resolution Global Maps of 21st-Century Forest Cover Change.' <i>Science</i> 342 (15 November): 850–53. Data available from: https://glad.earthengine.app/view/global-forest-change

⁹² [This dataset](#), assembled by Global Forest Watch, aggregates deforestation alerts from three alert systems (GLAD-L, GLAD-S2, RADD) into a single, integrated deforestation alert layer. Although called 'deforestation alerts' these alerts detect forest or tree cover disturbances. This product does not distinguish between human-caused and other disturbance types. Where alerts are detected within plantation forests (more likely to happen in the GLAD-L system), alerts may indicate timber harvesting operations, without a conversion to a non-forest land use.

Theme	Name	Description	Reference
Water stress	Aqueduct 4.0	Aqueduct Water Risk Atlas. Aqueduct 4.0, the latest iteration of WRI's water risk framework designed to translate complex hydrological data into intuitive indicators of water-related risk. 13 water risk indicators—spanning quantity, quality, and reputational concerns—are put into a comprehensive framework. Each indicator is sourced from an open-source, peer-reviewed data provider and then transformed to normalised risk score based on the severity of the water challenge.	https://www.wri.org/data/aqueduct-water-risk-atlas
Biodiversity	Forest Biodiversity	Map of Forest Biodiversity Intactness Index. This layer quantifies the human impact /pressures on the intactness of species communities. The maximum value indicates no human impact, while lower values indicate that intactness has been reduced. The PREDICTS database comprises over 3 million records of geographically and taxonomically representative data of land use impacts to local biodiversity (Hudson et al., 2017). From the same source the Biodiversity Significance can be used to the relative importance to the distribution of forest-dependent species of mammals, birds, amphibians, and conifers.	Hill, S.L., Arnell, A., Maney, C., Butchart, S.H., Hilton-Taylor, C., Ciciarelli, C., ... & Burgess, N.D. (2019). Measuring forest biodiversity status and changes globally. <i>Frontiers in Forests and Global Change</i> , 2, 70. https://doi.org/10.3389/ffgc.2019.00070
	KBA, Key Biodiversity Areas	'sites contributing significantly to the global persistence of biodiversity.' Criteria are described in the Global Standard for the Identification of Key Biodiversity Areas (IUCN 2016). Sites qualify as global KBAs if they meet one or more of 11 criteria, clustered into five categories: threatened biodiversity; geographically restricted biodiversity; ecological integrity; biological processes; and, irreplaceability.	World Database of Key Biodiversity Areas Full details of each KBA, including information on their biodiversity importance, can be viewed at http://www.keybiodiversityareas.org

Appendix 8 Interpretation of final human rights risk scores

WUR distinguishes four levels of risk: high, medium, low and no risk. We identified different recommendations for each risk level in Table 44 below. Based on the availability of data for a specific country for the chosen quantitative indicators, we further distinguish two scenarios in the table below: in most cases we have a final risk score based on robust quantitative information as well as a robust qualitative score; in some cases there was no data for the specific country, and we have the commodity risk score only (based on the qualitative work). These two cases have different implications for the recommendations. Additionally, the 'direct evidence' column distinguishes whether, based on the qualitative work, we were able to identify direct evidence of violations of a specific human rights issues taking place in the country of interest, for the specific commodity of interest.

Table 45 *Guidance on interpretation of risk thresholds.*

Risk Level	Colouring	Data availability	Direct evidence	Recommendation ⁹³
High Risk	Red	Final risk score based on quantitative and qualitative information	High risk with commodity-specific direct evidence	Users should assume that violations take place within their supply chain. Company- and supply chain specific information should be used for the prioritisation of remediation and prevention measures.
			High risk without commodity-specific direct evidence	Users should assume that violations take place in the production of the commodity within the specific country. Company- and supply chain specific data should be used to verify whether this is also the case for their specific supply chain, and if so, for the prioritisation of remediation and prevention measures.
	Red-Transparent	Commodity risk score only	High risk with commodity-specific direct evidence	Users should assume that violations take place within their supply chain. Company- and supply chain specific information should be used for the prioritisation of remediation and prevention measures.
			High risk without commodity-specific direct evidence	Users should assume that violations take place in the production of the commodity within a specific country. Company- and supply chain specific data should be used to verify whether this is also the case for their specific supply chain, and if so, for the prioritisation of remediation and prevention measures.
Medium Risk	Orange	Final risk score based on quantitative and qualitative information	Medium risk levels indicate the absence of commodity-specific direct evidence	Violations might take place in the production of the commodity within a specific country, but violations may be much more localised and the prevalence and severity of the violations is not clear. Company- and supply chain information is needed to assess whether violations take place in specific supply chains, as well as their severity. If so, this type of information should also be used for the prioritisation of prevention measures, and where relevant remediation measures as well.
			Orange-Transparent	Commodity risk score only
Low Risk	Yellow	Final risk score based on quantitative and qualitative information	Low risk levels indicate the absence of commodity-specific direct evidence	It is unlikely that violations occur in the production of the commodity within a specific country, but a (quick) validation needs to be conducted in order to confirm that these do not occur within a specific supply chain. Company- supply chain specific information can be used for the prioritisation of prevention measures.
			Yellow-Transparent	Commodity risk score only
No risk	Green	There is no risk.		No risk

⁹³ Please note that the OECD Guidelines and CSDDD suggest different types of risk factors for potentially high-risk situations (e.g. OECD, 2018: 25 & 62-63). WUR high-level risk assessment methodology does deal with 3 out of 4: sector, product and geographic risks. WUR methodology does not deal with "enterprise-level risk factors" this type of information should be added by the user to interpret the WUR risk assessment. This can mean that something labelled high risk at a sector level is only medium risk at company level (e.g. by presence of strong due diligence management systems and demonstrable good track record of supplier) or, vice versa, something labelled medium risk might be high risk at company level (e.g. weak governance, track record, vulnerable groups part of the workforce (incl. informal work)).

Risk thresholds per human rights risk theme

This section presents the risk thresholds per human rights risk theme.

Child labour

Risk Level Specification	Thresholds	Note on data-availability & thresholds interpretation
High risk	3.2 and higher	High risk with commodity-specific direct evidence: 4 and higher High risk without commodity-specific direct evidence: 3.2 – 3.9 (most cases)
Medium risk	2.3 – 3.1	
Low risk	2.2	
No risk	0	

Forced labour

Risk Level Specification	Thresholds	Note on data-availability & thresholds interpretation
High risk	3.0 and higher	High risk with commodity-specific direct evidence: 3.5 and higher High risk without sector-specific direct evidence: 3.0 – 3.4 (most cases)
Medium risk	2.2-2.9	
Low risk	0.1-2.1	
No risk	0	

Discrimination

Risk Level Specification	Thresholds	Note on data-availability & thresholds interpretation
High risk	3.2 and higher	High risk with commodity-specific direct evidence: 4 and higher High risk without commodity-specific direct evidence: 3.2 – 3.9 (most cases)
Medium risk	2.1-3.1	
Low risk	0.1-2.0	
No risk	0	

Violence & Harassment

Risk Level Specification	Thresholds	Note on data-availability & thresholds interpretation
High risk	3.0 and higher	High risk with commodity-specific direct evidence: 4 and higher High risk without commodity-specific direct evidence: 3.0 – 3.9 (in most cases)
Medium risk	2.1-2.9	
Low risk	0.1-2	
No risk	0	

Freedom of Association and Collective Bargaining

Risk Level Specification	Thresholds	Note on data-availability & thresholds interpretation
High risk	3.1- 5	High risk with commodity-specific direct evidence: 3.9 and higher High risk without commodity-specific direct evidence: 3.1 – 3.8 (in most cases)
Medium risk	2.4-3.0	
Low risk	0.1-2.3	
No risk	0	

Insufficient Remuneration

Risk Level Specification	Thresholds	Note on data-availability & thresholds interpretation
High risk	3.0-5.0	High risk with certainty: 4 and higher High risk with uncertainty: 3.0 – 3.9
Medium risk	2.0-2.9	
Low risk	0.1-1.9	
No risk	0	

Occupational Health and Safety

Risk Level Specification	Thresholds	Note on data-availability
High risk	3.5-5	
Medium risk	3 – 3.4	
Low risk	< 3	
No risk	0	

Access to Land and Material Resources

Risk Level Specification	Thresholds	Note on data-availability & thresholds interpretation
High risk	2.9 – 5	High risk with commodity-specific direct evidence: 3.9 and higher High risk without commodity-specific direct evidence: 2.9 – 3.8 (in most cases)
Medium risk	1.9 – 2.8	
Low risk	0.1-1.8	
No risk	0	

Conflict affected areas

For risk assessments in conflict-affected environments we recommend 'heightened human rights due diligence' (HHRDD) irrespective of the presented risk levels. The risk of gross human rights abuses is increased in conflict-affected areas. At the same time, companies can have impacts on the conflict and its dynamics and, vice versa, the conflict can have impacts on the activities of companies. This impact is often not (grasped) in the risk assessment as the situation is dynamic and data-availability is a severe issue.

Conflict-affected areas are identified by 'the presence of armed conflict, widespread violence or other risks of harm to people. Armed conflict may take a variety of forms, such as a conflict of international or non-international character, which may involve two or more states, or may consist of wars of liberation, or insurgencies, civil wars, etc.' (OECD, 2016: 13).

Heightened human rights due diligence requires the companies to increase their understanding of the context in which they operate and to ensure their activities or the activities of their business parties do not contribute to violence. Following UNDP (2022), this implies that companies should: understand the contexts of their operations, understand the interactions between business activities and the context, understand impact on human rights and use this understanding to void or mitigate negative impacts.

In the following cases HHRDD should take place:

1. In the case of widespread non-conventional armed violence;
2. In the case of international armed conflict between two states (regardless of intensity);
3. In the case of internal armed conflict;
4. In the case of military occupation;
5. In the case of gross human rights violations (genocide, crime against humanity, war crimes);
6. Or in the case of early warning signals of 1-5 (UNGP, 2022: 11).

It is out of the scope of the risk assessment methodology to develop and update a long list with 'conflict-affected areas' that is relevant for the scope of countries within the Due Diligence Dashboard. However for each batch of risk scores we do recommend heightened human rights due diligence in cases where we come across information of a conflict (following the criteria above) that (plausibly) interacts with the respective commodity sectors. But ultimately the user of the risk scores is responsible to engage in an own assessment of the need for heightened human rights due diligence related to its own operations.

More on the topic:

- Nagaivska, D. & Uvarova, O.; (2024); Companies Operating in Conflict-Affected environments Without Impacting the Conflict: Between Regular and Heightened Human Rights Due Diligence; Business and Human Rights Journal; p. 1-6
- OECD; (2016); OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High Risk Areas; Third Edition; OECD Publishing; Paris.
- UNDP (2022) Heightened Human Rights Due Diligence for business in conflict-affected contexts. A Guide; New York; United States of America.

FAQ: Can I disregard all risks that are labelled medium or low risk?

WUR developed a high-level risk assessment that is theme-, country- and commodity-specific and allows for zooming in at subnational levels. The risk assessment has been based on the analysis of secondary. Furthermore, this is not a risk assessment that is specific to a company or supply chain. Risks can manifest itself differently at different suppliers. Furthermore, data-availability issues can impact the benchmarked risk levels of specific risks. Therefore it is recommended to always combine this information with a company-specific assessment of these risk levels based on information on own operations, suppliers and business partners.

- ⁱ European Parliament; Council of the European Union (2022) DIRECTIVE (EU) 2022/2464 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 14 December 2022 amending Regulation (EU) No 537/2014, Directive 2004/109/EC, Directive 2006/43/EC and Directive 2013/34/EU, as regards corporate sustainability reporting; Official Journal of the European Union; 2022/322; <https://eur-lex.europa.eu/eli/dir/2022/2464/oj/eng>
- ⁱⁱ European Parliament; Council of the European Union (2023) REGULATION (EU) 2023/1115 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 31 May 2023 on the making available on the Union market and the export from the Union of certain commodities and products associated with deforestation and forest degradation and repealing Regulation (EU) No 995/2010; Official Journal of the European Union; 2023/150; <https://eur-lex.europa.eu/eli/reg/2023/1115/oj/eng>
- ⁱⁱⁱ European Parliament; Council of the European Union (2024) DIRECTIVE (EU) 2024/1760 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 13 June 2024 on corporate sustainability due diligence and amending Directive (EU) 2019/1937 and Regulation (EU) 2023/2859; Official Journal of the European Union; 2024/1760; https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:L_202401760
- ^{iv} European Commission (2022) REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on prohibiting products made with forced labour on the Union market <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52022PC0453>
- ^v European Parliament; Council of the European Union (2024) REGULATION (EU) 2020/852 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 18 June 2020 on the establishment of a framework to facilitate sustainable investment, and amending Regulation (EU) 2019/2088; Official Journal of the European Union; 2020/198; <https://eur-lex.europa.eu/eli/reg/2020/852/oj/eng>
- ^{vi} United Nations (2011) Guiding Principles on Business and Human Rights. Implementing the United Nations 'protect, respect and remedy' framework. https://www.ohchr.org/sites/default/files/documents/publications/guidingprinciplesbusinesshr_en.pdf
- ^{vii} OECD (2011) OECD Guidelines for Multinational Enterprises, https://www.oecd.org/en/publications/oecd-guidelines-for-multinational-enterprises_9789264115415-en.html
- ^{viii} OECD (2018) OECD Due Diligence Guidance for Responsible Business Conduct, <https://mneguidelines.oecd.org/OECD-Due-Diligence-Guidance-for-Responsible-Business-Conduct.pdf>
- ^{ix} OECD (2023) OECD Guidelines for Multinational Enterprises on Responsible Business Conduct, OECD Publishing, Paris, https://www.oecd.org/en/publications/oecd-guidelines-for-multinational-enterprises-on-responsible-business-conduct_81f92357-en.html
 OECD (2022) *Translating a risk-based due diligence approach into law: Background note on Regulatory Developments concerning Due Diligence for Responsible Business Conduct* <https://mneguidelines.oecd.org/translating-a-risk-based-due-diligence-approach-into-law.pdf> ^x
- ^{xi} International Labour Organization (n.d.) What is Child labour. Available at: <https://www.ilo.org/international-programme-elimination-child-labour-ipecc/what-child-labour> Accessed at: 12-3-2025
- ^{xii} International Labour Organization (1930) Co29- Forced Labour Convention, 1930 (no. 29). https://normlex.ilo.org/dyn/nrmlx_en/f?p=NORMLEXPUB:12100:0::NO::P12100_ILO_CODE:C029
- ^{xiii} International Labour Organization (n.d.) What is forced labour? Available at: <https://www.ilo.org/topics/forced-labour-modern-slavery-and-trafficking-persons/what-forced-labour>. Accessed at: 12-3-2025
- ^{xiv} International Labour Organization (1958) Discrimination (employment and occupation) Convention, 1958 (no. 111); https://normlex.ilo.org/dyn/nrmlx_en/f?p=NORMLEXPUB:12100:0::NO:12100:P12100_INSTRUMENT_ID:312256:NO
- ^{xv} International Labour Organization (2019) C190 – Violence and Harassment Convention, 2019 (No. 190); https://normlex.ilo.org/dyn/nrmlx_en/f?p=NORMLEXPUB:12100:0::NO::P12100_ILO_CODE:C190
- ^{xvi} International Labour Organization (1948) Co87 – Freedom of Association and Protection of the Right to Organise Convention, 1948 (No. 87); https://normlex.ilo.org/dyn/nrmlx_en/f?p=NORMLEXPUB:12100:0::NO:12100:P12100_INSTRUMENT_ID:312232:NO
- ^{xvii} International Labour Organization (1949) Co98 – Right to Organise and Collective Bargaining Convention, 1949 (No. 98); https://normlex.ilo.org/dyn/nrmlx_en/f?p=NORMLEXPUB:12100:0::NO:12100:P12100_INSTRUMENT_ID:312243:NO
- ^{xviii} International Labour Organization (2006); C187 – Promotional Framework for Occupational Safety and Health Convention, 2006 (no. 187); https://normlex.ilo.org/dyn/nrmlx_en/f?p=normlexpub:12100:0::no:12100:p12100_instrument_id:312332:no
- ^{xix} International Labour Organization (1981) C155- Occupational Safety and Health Convention, 1981 (no. 155); https://normlex.ilo.org/dyn/nrmlx_en/f?p=NORMLEXPUB:12100:0::NO::P12100_ILO_CODE:C155
- ^{xx} International Labour Organization (1985) C161 – Occupational Health Services Convention, 1985 (no. 161); https://normlex.ilo.org/dyn/nrmlx_en/f?p=normlexpub:12100:0::no:12100:p12100_instrument_id:312306:no
- ^{xxi} <https://webapps.ilo.org/ilostat-files/SSM/SSM8/E/ANNEX.html>
- ^{xxii} Shift Project; Mazars (2015) UNGP Reporting Framework with Implementation guidance. https://www.ungpreporting.org/wp-content/uploads/UNGPREportingFramework_withguidance2017.pdf
 Shift Project (2014) Business and Human Rights Impacts: identifying and Prioritizing Human Rights Risks https://shiftproject.org/wp-content/uploads/2014/01/Shift_SERworkshop_identifyHRrisks_2014.pdf
 Shift Project (2016a) Exploring the concept of prioritization: an explanatory note for the Dutch sector covenant process https://shiftproject.org/wp-content/uploads/2020/06/Shift_NoteonPrioritizationforSER_Feb2016.pdf
 Shift, Oxfam and Global Compact Network Netherlands; (2016b); Doing Business with Respect for Human Rights: A Guidance Tool for Companies; Accessible via: https://www.businessrespecthumanrights.org/image/2016/10/24/business_respect_human_rights_full.pdf
- ^{xxiii} International Labour Organization (1970) C131- Minimum Wage Fixing Convention, 1970 (No. 131) https://normlex.ilo.org/dyn/nrmlx_en/f?p=NORMLEXPUB:12100:0::NO:12100:P12100_INSTRUMENT_ID:312276:NO
- ^{xxiv} FAO (2006) FAO Land Tenure Manuals, No. 2., FAO. <https://www.fao.org/4/a0557e/a0557e00.pdf>
- ^{xxv} Intact Forest Landscapes. (n.d.). Intact Forest Landscapes Data [Data set]. Intact Forest Landscapes. <https://intactforests.org/data.ifl.html>
- ^{xxvi} Protected Planet. (n.d.). Protected Planet Data [Data set]. Protected Planet. www.protectedplanet.net
- ^{xxvii} Global Forest Change. (n.d.). Global Forest Change Data [Data set]. Global Forest Change. <https://glad.earthengine.app/view/global-forest-change>.
- ^{xxviii} Stephens, B. (2023). Global forest change dataset (Version 1) [Data set]. Harvard Dataverse. <https://doi.org/10.7910/DVN/SWPENT>.

Wageningen Social & Economic Research
P.O. Box 88
6700 AB Wageningen
The Netherlands
T +31 (0)317 48 48 88
E info.wser@wur.nl
wur.eu/social-and-economic-research

REPORT 2025-A023



The mission of Wageningen University & Research is “To explore the potential of nature to improve the quality of life”. Under the banner Wageningen University & Research, Wageningen University and the specialised research institutes of the Wageningen Research Foundation have joined forces in contributing to finding solutions to important questions in the domain of healthy food and living environment. With its roughly 30 branches, 7,900 employees (7,100 fte), 2,500 PhD and EngD candidates, 12,700 students and 80,000 participants to WUR’s Life Long Learning, Wageningen University & Research is one of the leading organisations in its domain. The unique Wageningen approach lies in its integrated approach to issues and the collaboration between different disciplines.

To explore
the potential
of nature to
improve the
quality of life



Wageningen Social & Economic Research
P.O. Box 88
6700 AB Wageningen
The Netherlands
T +31 (0) 317 48 48 88
E info.wser@wur.nl
wur.eu/social-and-economic-research

Report 2025-A023

The mission of Wageningen University & Research is "To explore the potential of nature to improve the quality of life". Under the banner Wageningen University & Research, Wageningen University and the specialised research institutes of the Wageningen Research Foundation have joined forces in contributing to finding solutions to important questions in the domain of healthy food and living environment. With its roughly 30 branches, 7,700 employees (7,000 fte), 2,500 PhD and EngD candidates, 13,100 students and over 150,000 participants to WUR's Life Long Learning, Wageningen University & Research is one of the leading organisations in its domain. The unique Wageningen approach lies in its integrated approach to issues and the collaboration between different disciplines.

