Forest Stewardship Council®

International Generic Indicators (IGI) addendum

IGI附則

IGI for the use of Highly Hazardous Pesticides

非常に危険な農薬使用のためのIGI

FSC-STD-60-004a

DRAFT 2-0

FSC FORESTS FOR ALL FOREVER™

Standard

A. INTERNATIONAL GENERIC INDICATORS INCLUDING ADJUSTMENTS TO CRITERION 10.7 TO REFLECT CHANGES IN *FSC-POL-30-001 FSC PESTICIDES POLICY*

FSC－POL-30-001 FSC農薬指針を反映した、IGI基準10.7

10.7 The *Organization *shall** use integrated pest management and *silviculture** systems which avoid, or aim at eliminating, the use of *chemical pesticides**. The *Organization** *shall** not use any *chemical pesticides** prohibited by FSC policy. When *pesticides** are used, The *Organization** *shall** prevent, mitigate, and/or repair damage to *environmental values** and human health. (C6.6 and C10.7 P&C V4).**

基準* **10.7**組織*は、化学農薬*の使用を避ける、あるいは完全に排除するため、育林*体系に基づく総合的な病虫獣害対策を構築しなければならない。また**FSC**の方針により禁止されている化学農薬*は使用してはならない。農薬*を使用する際には、多面的機能*の劣化と人体への健康被害を防ぎ、影響があった際には、影響を軽減するもしくは多面的機能*と健康を回復しなければならない。

Proposed Instructions and IGIs under 10.7

INSTRUCTIONS FOR STANDARD DEVELOPERS: Standard Developers shall* include the relevant aspects of the 'FSC Guide to integrated pest, disease and weed management in FSC certified forests and plantations' (2009) and associated policies, guidelines, advice notes and other FSC normative documents for the development of indicators (Indicator 10.7.1).

Standard Developers shall* either reference or include the relevant aspects of the ILO document "Safety in the use of chemicals at work" (Geneva, ILO, 1993) or any national interpretation of this document in National Standards (Indicator 10.7.4).

Standards Developers shall consider the Annex 'International Generic Indicators for the use and risk management of Highly Hazardous Pesticides (HHP)' and develop national indicators for HHP used or likely to be used in the country.

Standards Developers should consider listing the requirements in FSC-POL-30-001 V3-0 FSC Pesticides Policy Clause 4.12 in National Standards.

10.7.1 Integrated pest management, including selection of *silviculture** systems, is used to avoid, or aim to eliminate, the frequency, extent and amount of chemical *pesticide** applications, and result in non-use or overall reductions in applications.
化学農薬の使用の回避、あるいは将来的な不使用を目指し、森林資源管理には、育林方法の決定を含む、総合的な病虫獣害対策が実施されており、リスクと比較して、化学農薬の使用頻度、使用範囲、使用量の全体的な削減、あるいは不使用に至っている。

10.7.2 Prior to using *chemical pesticides**, the requirements of the ESRA framework for Organizations (FSC-POL-30-001 V3-0 FSC Pesticides Policy clause 4.12) are met.
化学農薬の使用に先立ち、組織の環境・社会リスクアセスメントの枠組み（FSC-POL-30-001 V3-0 FSC農薬指針4.12項）の要求事項が満たされている。

10.7.3 ESRA is reviewed and, if necessary, revised within the five-year certificate cycle.
環境・社会リスクアセスメントは、5年の認証サイクルの期間内に見直され、必要に応じて修正されている。

10.7.4 Affected and *interested stakeholders** are informed about the ESRA process and provided with an opportunity for culturally *appropriate** *engagement**.
影響を受ける者と関心の高い者が環境・社会リスクアセスメントの過程で通知を受け、文化的に適切な方法で関与するための機会を与えられている。

10.7.5 A decision process and rationale are in place to select the option that demonstrates least social and environmental damages, more effectiveness and equal or greater social and environmental benefits.
最も社会慣行的な被害が少なく、より効果的で、社会・環境的なメリットが同等以上である選択肢を選択していることを示す意思決定プロセスと理由がある。

10.7.6 Records of *pesticide** usages are maintained, including trade name, active ingredient, quantity of active ingredient used, period of use, number and frequency of applications, location and area of use and reason for use.
農薬*を使用する場合、商品名、有効成分、有効成分の使用量、使用期間、使用回数及び頻度、使用場所、使用面積、使用理由が記録されている。

10.7.7 The use of *pesticides** complies with the ILO document “Safety in the use of chemicals at work” regarding requirements for the transport, storage, handling, application and emergency procedures for clean-up following accidental spillages.
農薬*を使用する際の取扱い（輸送、保管、使用方法、漏出の際の緊急時取り扱い方法を含む）はILO文書「職場での化学物質の使用における安全衛生」に従っている。

10.7.8 If *pesticides** are used, application methods minimize quantities used, while achieving effective results, and provide effective *protection** to surrounding *landscapes**.
農薬*を使用する際は、効果を得ながら使用量が最小限とするように使用されている。また、周辺の景観*に対する効果的な保護*施策が取られている。

10.7.9 Damage to *environmental values** and human health from *pesticide** use is prevented and mitigated or repaired where damage occurs.
農薬*の使用による、多面的機能*の劣化と人体への健康被害は避けられている。影響があった際には、影響を軽減するもしくは多面的機能*と健康は回復されている。

10.7.10 When pesticides* are used:
農薬*を使用する場合は以下をいずれも満たす：

1) The selected *pesticide**, application method, timing and pattern of use offers the least risk to humans and *non-target species**; and
農薬*の選択、使用方法、使用時期、使用パターンは人体や標的以外の種に対して与えるリスク*が最小限となるよう配慮されている。

2) Objective evidence demonstrates that the *pesticide** is the only effective, practical and cost-effective way to control the pest.
病虫獣害を制御するためには当該農薬*が唯一の効果的かつ現実的で費用効果が高い方法であることを示す客観的な証拠がある。

B. INTERNATIONAL GENERIC INDICATORS FOR THE USE AND RISK MANAGEMENT OF HIGHLY HAZARDOUS PESTICIDES (HHP)

非常に危険な農薬（HHP）の使用及びリスク管理のためのIGI

INSTRUCTIONS FOR STANDARD DEVELOPERS:

Standard Developers *shall** follow Annex 4 of FSC-POL-30-001 FSC Pesticide Policy V3-0: Procedure to implement policy requirements for ESRA framework at national level, prior to considering this set of International Generic Indicators. This procedure describes how Standards Developers shall use Annex 2 to establish the conditions for the use of highly restricted and restricted HHPs at national level.

Standard Developers *shall** incorporate the IGIs to the national context and develop locally relevant thresholds or conditions for the use of the relevant FSC Highly Restricted HHPs and FSC Restricted HHPs permitted for use.

Standard Developers *shall** engage with *stakeholders** in this process as per FSC-STD-60-006 Process Requirements for the Development and Maintenance of National Forest Stewardship Standards and FSC-PRO-60-007 Structure, Content and Development of Interim National Standards.

Standard Developers *shall** consider *workers'** rights in relation to use of pesticides in accordance with the ILO Code of Practice Safety in the use of chemicals at work, including the right to refuse to use HHPs.

Indicators for the use and risk management of specific HHPs are recommended to be compiled into an annex of the National Standards, but they can be inserted to the body of the National Standard. Also, combining these two options is possible.

In case indicators are inserted to the national standard, the need for the HHP indicators should be considered at least for following criteria: C1.3; C1.6; C2.1; C2.3; C2.5; C2.6; C3.1; C3.2; C4.1; C4.2; C4.5; C4.6; C4.7; C5.1; C6.1; C6.2; C6.3; C6.6; C6.7; C7.4; C7.6; C8.2; C8.3; C8.4; C9.1; C9.3; C10.7; C10.8; C10.12. (The list is based on desk studies conducted in South Africa, New Zealand, UK and Brazil. The studies are available from FSC IC by request to forestmanagement@fsc.org).

INTERNATIONAL GENERIC INDICATORS FOR ALL HHPS

すべてのHHPに関するIGI

INSTRUCTIONS FOR STANDARD DEVELOPERS:

Standard Developers *shall** determine, using *Best Available Information*,* whether *critical population density** is an appropriate measure to determine *intervention threshold** for a particular pest.

Standard Developers *shall** consider total formulations including active ingredient and inert or co-formulants (e.g. surfactant, wetter, adjuvant, additive).

Standard Developers *shall** specify research, identify and test alternatives to replace FSC highly restricted HHPs and restricted HHPs with less hazardous alternatives, subject to *scale, intensity and risk**.

1.1 A documented Integrated Pest Management (IPM) system, consistent with the 'FSC Guide to Integrated Pest, Disease and Weed Management' in FSC certified forests and plantations, is in place to avoid, or aim to eliminate, the

use of chemical pesticides in management units (MU), and minimize risks to human health and the environment while maintaining economically viable management.

経済的に継続可能な管理を維持しつつも、管理区画内での化学農薬使用を避けるか排除を目指し、人体への健康と環境へのリスクを最小限とするために、FSC認証林において、「総合的な病虫獣害対策に関するFSCガイド」を満たす、文書化された総合的な病虫獣害対策がある。

1.2 In addition to existing IGI 10.7.3 (proposed IGI 10.7.4) requirements, the following records of HHP usage and IPM implementation are maintained, subject to scale, intensity and risk of management activities:
既存のIGI10.7.3（今回提案されているIGI10.7.4）の要求事項に加え、管理活動の規模、強度とリスクに応じた範囲で、HHP使用及び総合的な病虫獣害対策に関する貴下の記録が保持されている。

a) level of target pest infestation,
病虫獣害の蔓延度合い
b) the decision process and rationale for selecting a Highly Restricted or Restricted HHPs over a non HHP *chemical pesticide** or *non-chemical pesticide** control method,
非HHPリスト掲載農薬や化学農薬を使用しない抑制方法ではなく、高度制限または制限農薬を選択した意思決定プロセスとその理由
c) risk assessment for operator safety, detailing the processes to be followed in carrying out the HHP application, following appropriate legislation or guidelines,
農薬使用者の安全に関するリスクアセスメント。これには法令やガイドラインに従ったHHP使用の際の手続きの詳細を含む
d) assessment of the economic impact of the pest and/or other justification for interventions,
病虫獣害の経済的な被害状況に関するアセスメント及び/または対策措置に関するその他の理由
e) application methodology,
使用方法
f) who made the application,
使用した者
g) total annual volume of active ingredient used,
使用された有効成分の年間合計量
h) time and date of treatment,
使用日および時間
i) the weather conditions at time of application,
使用時の天候
j) any disposals or spillage, including action taken to prevent contamination and/or harm,
廃棄または漏出の有無。これには汚染及び/または被害を防ぐための措置を含む
k) evaluation and monitoring of the effectiveness of treatment,
農薬処理の効果の評価とモニタリング
l) mapped boundaries of treatment area and pest affected area when relevant.
農薬処理地域と関係する場合は病虫獣害の影響を受けている地域の地図上の境界

1.3 ESRA(s), site operational plans, and site-specific risk mitigation and monitoring measures for HHPs take account of *secondary or latent health impacts*, sublethal effects** and/or *chronic toxicity**.
環境・社会リスクアセスメント、サイトの施業計画、HHPに関するサイト特有のリスク回避・低減措置は、副次的または潜在的な健康への影響、致死未満の影響及び/または慢性毒性を考慮している。

1.4 Control measures are proactively considered and/or implemented before *intervention threshold**, and/or *critical population densities** of the targeted pest are reached.
対象となる病虫獣害が対策が必要となる閾値及び/または臨界個体数密度に達する前に抑止措置が積極的に検討されている及び/または実施されている。

1.5 A trend of replacement, reduction and/or removal of HHPs over time is demonstrated or otherwise justified.
徐々にHHPを置き換える、減らす及び/または使用停止する傾向が示されているまたは、傾向が示されない正当な理由がある。

1.6 Use of HHPs is limited to the minimum effective dose based on the label and *Best Available Information**
利用可能な最も有効な情報及び商品ラベルに基づき、HHPの使用は効果を発揮する最少量に限定されている。

NOTE: In some cases, effective dose range rather than a single dose will need to be determined, depending on the pest.
注：病虫獣害によっては、1回の使用量よりも効果的な使用量の幅を決める必要がある場合もある。

1.7 Directly or potentially *affected stakeholders** are provided with safety information, through *culturally appropriate* engagement**, before HHPs are used.
直接または潜在的に影響を受ける者は、HHPが使用される前に安全に関する情報を文化的に適切な方法で伝えられている。

a) The safety information for the particular HHP is provided in a culturally appropriate and accessible format.
文化的に適切かつ利用可能な形式で、対象となるHHPの安全に関する情報が提供されている。

b) The information complies with World Health Organization in Guidelines for personal protection in handling the pesticides.
情報は、農薬の取扱いにおける使用者の防護に関するWHOのガイドラインを満たす。

c) An *exclusion zone** is established where a HHP and/or application method requires one, as instructed by the label, or other applicable sources, to avoid *workers** and *affected stakeholders** from being exposed to harm.
HHP及び/またはその使用方法によって必要となる場合は、労働者及び影響を受ける者が被害にさらされることを避けるために、商品ラベルまたはその他の情報源の指示に従い排除区域が設定されている。

1.8 A *pesticides buffer zone** is established where a HHP and/or application method requires one to ensure the protection of environmental and cultural values.
HHP及び/またはその使用方法によって必要となる場合は、環境及び文化的な価値の保護を保証するために農薬緩衝帯が設けられている。

1.9 In the case of an emergency situation or by governmental order the use of Highly Restricted and Restricted HHPs conforms with the use of FSC prohibited HHPs specified in Annex 3 of FSC-POL-30-001 *FSC Pesticides Policy*.
緊急事態または政府による命令によって高度制限及び制限HHPを使用する場合は、FSC-POL-30-001 FSC農薬指針の附則3に定められているFSC禁止HHPの使用を満たすこと。

1.10 Programmes are in place that have clear actions, timelines, targets and resources allocated to research, identify and test alternatives to replace FSC highly restricted HHPs and restricted HHPs with less hazardous alternatives.
FSC高度制限HHP及び制限HHPをより危険性の低い代替手法に置き換えるために、調査研究、特定、試験するためのリソースが割り当てられ、明確な行動計画と期限、目標を有するプログラムを持つこと。

1.11 Training programmes for the use of HHPs include informing *workers** of known risks to human health and environmental values; and mitigation measures identified in the ESRA
HHP使用に関する教育訓練プログラム。これには、労働者へ既知の人体の健康と環境価値へのリスク及び環境・社会リスクアセスメントで特定されたリスク回避・低減措置を伝えることが含まれる。

以降の項目は「哺乳類及び鳥類に対する急性毒性」「発がん性」のような危険性の種類ごとの指標が10種類分規定されている（内容は概ね同じ）
その後に附則Aとして危険性グループごとに、いくつかの農薬有効成分について、必要な個人防護具と医学的バイオモニタリング（人体への農薬の影響を調べるための血液、尿等の検査）及びその情報源が紹介されている。

C. INTERNATIONAL GENERIC INDICATORS FOR HAZARD CRITERIA
危険性の基準に関するIGI

Hazard Groups 危険性グループ	Number 基準番号	Hazard Criteria 危険性基準
Relevant International Agreements or conventions 関連国際合意または条例	1	Relevant International Agreements or conventions 関連国際合意または国際条例
Acute toxicity 急性毒性	2	Acute toxicity to mammals and birds 哺乳類及び鳥類に対する急性毒性
Chronic toxicity 慢性毒性	3	Carcinogenicity 発がん性
	4	Mutagenicity to mammals 哺乳類に対する突然変異誘発性
	5	Developmental and reproductive toxicity 生殖・発生毒性
	6	Endocrine disrupting chemical (EDC) 内分泌攪乱物質（環境ホルモン）
Environmental toxicity 環境毒性	7	Acute toxicity to aquatic organisms 水生生物に対する急性毒性
	8	Persistence in soil or water and soil sorption potential and bio-magnification and bioaccumulation 土壌と水への残留性、土壌吸着性、生物濃縮及び生物蓄積
Dioxins ダイオキシン	9	Dioxins (residues or emissions) ダイオキシン（残留または排出）
Heavy metals 重金属	10	Heavy metals 重金属

Table 1. Hazard Groups and Criteria for the identification of highly hazardous pesticides (Source: *FSC-POL-30-001 FSC Pesticides Policy*).
表1. 非常に危険な農薬（HHP）特定のための危険性グループと基準（出典：FSC-POL-30-001 FSC農薬指針）

Hazard Group Relevant international agreements or conventions

危険性グループ：関連国際合意または条例

1. Indicators for HHPs that meet Hazard Criterion 1 (Relevant international agreements or conventions)

危険性基準1（関連国際合意または国際条約）を満たすHHPに関する指標

INSTRUCTIONS FOR STANDARD DEVELOPERS:

Compliance with IGIs is required in Annex 3 of the FSC Pesticides Policy since these are prohibited HHPs. This instruction is expected to be applied by those Standards Developers that choose to strengthen the requirements for prohibited HHPs.

Standard Developers *shall** refer directly to the following documents where relevant to the HHPs in question or bring the relevant aspects into National Standards. Standard Developers *may** make use of any national interpretations of these documents in laws, regulations, codes of practice, and other governmental guidance.

- FSC POL-30-001a FSC Lists of highly hazardous pesticides.
- Global Harmonized System of Classification and Labelling of Chemicals (GHS) 8th Edition. United Nations (UN), New York & Geneva, 2019. Part 3, Chapters 3.1-, 3.5- 3.9 and Part 4 Chapter 4.2.
- The WHO Recommended Classification of Pesticides by Hazard and Guidelines to Classification, 2009. World Health Organization (WHO), International Programme on Chemical Safety (IPCS) and Inter-Organization Programme for Sound Management of Chemicals (IOMC). Table 1, Table 6, Table 7.
- International tools for preventing local pesticide problems: A consolidated guide to chemical codes and conventions. European Centre on Sustainable Policies for Human and Environmental Rights (ECSPHR), 2008. Section 3, Section 5.2.1.
- International Code of Conduct on Pesticide Management. Guidelines for personal protection when handling and applying pesticides. 9th draft, 2019. FAO & WHO. Part 1, Sections 1.1, 1.3, 1.4 and Annex 6.

Standard Developers *shall** consider total formulations including active ingredient and inert or co-formulants (e.g. surfactant, wetter, adjuvant, additive).

Standard Developers *shall** prioritize the development of indicators for the identification of harm and identify the required treatment before looking at compensation when it comes to human health.

1.1 When HHPs that meet Hazard Criteria 1 are used, Annex 3. Procedure for the exceptional use of FSC prohibited HHPs in FSC-POL-30-001 FSC Pesticides Policy is applied.
危険性基準1を満たすHHPが使用される際には、FSC-POL-30-001 FSC農薬指針の附則3 FSC禁止HHPの例外的な使用に関する手順が適用される。

1.2 Medical *biomonitoring** of *workers** exposed to HHPs that meet these Hazard Criteria is conducted following a methodology based on an analysis of current *Best Available Information**.

これらの危険性基準を満たすHHPに暴露した労働者の医学的バイオモニタリング（人体への農薬の影響を調べるための血液、尿等の検

査）が、現在利用可能な最も有効な情報の分析に基づく方法に従って行われている。

1.3 Appropriate actions are taken to avoid harm, as identified through the application of the identified *medical biomonitoring** methodology.

特定された医学的バイオモニタリングの方法を通じて特定された、被害を回避・低減するための適切な措置が取られている。

1.4 Health and safety practices for *workers** and *affected stakeholders** are developed and implemented.

労働者及び影響を受ける者の健康と安全に関する対策が構築され、実施されている。

1.5 Harm caused to *workers** and *affected stakeholders** by over-exposure to HHPs in these Hazard Criteria is treated and\or *fair compensation** is provided.

これらの危険性基準に該当するHHPへの暴露過多によって労働者及び影響を受ける者が受けた被害は、処置がされ及び/または公正な補償がされている。

NOTE: Standards Developers shall refer to Appendix 1: Personal Protective Equipment (PPE), Medical Biomonitoring, and References By Hazard Groups where current international *Best Available Information** for each of the relevant indicators can be found.

注：規格策定者は、各指標に関する利用可能な最も有効な情報が掲載されている、本文書附則1「危険性グループごとの個人防護具、医学的バイオモニタリング及びその情報源」を参照すること。

Hazard Group Acute Toxicity

危険性グループ：急性毒性

2. Indicators for HHPs that meet Hazard Criterion 2 (Acute toxicity to mammals and birds)

危険性基準2（哺乳類及び鳥類に対する急性毒性）を満たすHHPに関する指標

INSTRUCTIONS FOR STANDARD DEVELOPERS:

Standard Developers *shall** refer directly to the following documents where relevant to the HHPs in question or bring the relevant aspects into National Standards. Standard Developers *may** make use of any national interpretations of these documents in laws, regulations, codes of practice, and other governmental guidance.

- Severely Hazardous Pesticides formulations toolkit (sections 4 and 5) (UNEP FAO).
- Safety and Health in Forestry work. International Labour Office (ILO), Geneva. ILO code of practice. 1998. Part III, Chapters 6, 7 and 9.
- The WHO Recommended Classification of Pesticides by Hazard and guidelines to classification. 2009. World Health Organization (WHO), International Programme on Chemical Safety (IPCS) and Inter-Organization Programme for Sound Management of Chemicals (IOMC). Tables 1,2, 3 and 7.
- International Code of Conduct on Pesticide Management. Guidelines on Highly Hazardous Pesticides FAO &WHO, 2016. Chapters 2,3 and 6.

- Sound and Sustainable Management of Chemicals. A training manual for workers and trade unions. United Nations Environment Programme (UNEP).2008. Module 2.
- Global Harmonized System of Classification and Labelling of Chemicals (GHS) 8th Edition. United Nations (UN), New York & Geneva, 2019. Part 3, Chapter 3.1.
- Recognition and management of pesticide Poisonings.6th Edition. 2013. United States Environmental Protection Agency (EPA), Office of Pesticide Programmes. Section I Chapter 2, Section VI and Section VII. Cross reference with 2.1.3. These are the biomonitoring indicators and signs and symptoms of acute poisoning.
- International Code of Conduct on Pesticide Management. Guidelines for personal protection when handling and applying pesticides. 9th draft. 2019. FAO & WHO. Part 1, Sections 1.1, 1.3, 1.4 and Annex 6.

Standard Developers *shall** consider total formulations including active ingredient and inert or co-formulants (e.g. surfactant, wetter, adjuvant, additive).

Standard Developers *shall** prioritize the development of indicators for the identification of harm and identify the required treatment before looking at compensation when it comes to human health.

2.1 *Medical biomonitoring** of *workers** exposed to HHPs that meet these Hazard Criteria is conducted following a methodology based on an analysis of current *Best Available Information**.

これらの危険性基準を満たすHHPに暴露した労働者の医学的バイオモニタリングが、現在利用可能な最も有効な情報の分析に基づく方法に従って行われている。

2.2 Appropriate actions are taken to avoid harm, as identified through the application of the identified *medical biomonitoring** methodology.

特定された医学的バイオモニタリングの方法を通じて特定された、被害を回避・低減するための適切な措置が取られている。

2.3 Health and safety practices for *workers** and *affected stakeholders** are developed and implemented.

労働者及び影響を受ける者の健康と安全に関する対策が構築され、実施されている。

NOTE: For Hazard Criterion 2, a *preadolescent** is particularly at risk from the effects of these HHPs.

注：危険性基準2に関して、思春期直前の子どもはこれらのHHPの影響を受けるリスクが特に高い。

2.4 Harm caused to *workers** and *affected stakeholders** by over-exposure to HHPs in these Hazard Criteria is treated and\or *fair compensation** is provided.

これらの危険性基準に該当するHHPへの暴露過多によって労働者及び影響を受ける者が受けた被害は、処置がされ及び/または公正な補償がされている。

NOTE: Standards Developers shall refer to Appendix 1: Personal Protective Equipment (PPE), Medical Biomonitoring, and References By Hazard Groups where current international *Best Available Information** for each of the relevant indicators can be found.

注：規格策定者は、各指標に関する利用可能な最も有効な情報が掲載されて

いる、本文書附則1「危険性グループごとの個人防護具、医学的バイオモニタリング及びその情報源」を参照すること。

Hazard Group Chronic Toxicity
危険性グループ：慢性毒性

3. Indicators for HHPs that meet Hazard Criterion 3 (Carcinogenicity)
危険性基準3（発がん性）を満たすHHPに関する指標

Instructions for Standard Developers:

Standard Developers *shall** refer directly to the following documents where relevant to the HHPs in question or bring the relevant aspects into National Standards. Standard Developers *may** make use of any national interpretations of these documents in laws, regulations, codes of practice, and other governmental guidance:

- Severely Hazardous Pesticides formulations toolkit (sections 4 and 5) (UNEP FAO).
- FAO HHP protection of children in low to middle income countries (FAO 2015).
- Global Harmonized System of Classification and Labelling of Chemicals (GHS) 8th Edition. United Nations (UN), New York & Geneva, 2019. Part 3, chapter 3.6.
- International Code of Conduct on Pesticide Management. Guidelines for personal protection when handling and applying pesticides. 9th draft. 2019. FAO & WHO. Part 1, sections 1.1, 1.3, 1.4 and Annex 6.
- Safety and Health in Forestry work. International Labour Office (ILO), Geneva. ILO code of practice. 1998. Part III, Chapters 6, 7 and 9.
- The WHO Recommended Classification of Pesticides by Hazard and guidelines to classification. 2009. World Health Organization (WHO), International Programme on Chemical Safety (IPCS) and Inter-Organization Programme for Sound Management of Chemicals (IOMC). Tables 1,2, 3 and 7.
- Understanding the Impacts of Pesticides on Children: A discussion paper. 2018. UNICEF.
- Recognition and management of pesticide Poisonings.6th Edition. 2013. United States Environmental Protection Agency (EPA), Office of Pesticide Programmes. Chapter 1 deals with special populations and environmental justice (page 9) covering children's risk.
- An NGO Guide to SAICM (The Strategic Approach to International Chemicals Management) 2008. Chapters 5.1.4 and 5.1.5 and 5.1.7
- International tools for preventing local pesticide problems: A consolidated guide to chemical codes and conventions. European Centre on Sustainable Policies for Human and Environmental Rights (ECSPHR), 2008. Chapter 3, section 4.2.5, 4.3.5 and Chapter 6.
- Recognition and management of pesticide Poisonings.6th Edition. 2013. United States Environmental Protection Agency (EPA), Office of Pesticide Programmes. Section I chapter 2, section VI and section VII
- Safety and Health in Forestry work. International Labour Office (ILO), Geneva. ILO code of practice. 1998. Part III, Chapters 6, 7 and 9.

Standard Developers *shall** consider total formulations including active ingredient and inert or co-formulants (e.g. surfactant, wetter, adjuvant, additive).

Standard Developers *shall** prioritize the development of indicators for the identification of harm and identify the required treatment before looking at compensation when it comes to human health.

3.1 Medical *biomonitoring** of *workers** exposed to HHPs that meet these Hazard Criteria is conducted following a methodology based on an analysis of current *Best Available Information**.

これらの危険性基準を満たすHHPに暴露した労働者の医学的バイオモニタリングが、現在利用可能な最も有効な情報の分析に基づく方法に従って行われている。

3.2 Appropriate actions are taken to avoid harm, as identified through the application of the identified *medical biomonitoring** methodology.

特定された医学的バイオモニタリングの方法を通じて特定された、被害を回避・低減するための適切な措置が取られている。

3.3 Health and safety practices for *workers** and *affected stakeholders** are developed and implemented.
労働者及び影響を受ける者の健康と安全に関する対策が構築され、実施されている。

3.4 Harm caused to *workers** and affected stakeholder by over-exposure to a HHP in these Hazard Criteria is treated and\or *fair compensation** is provided.

これらの危険性基準に該当するHHPへの暴露過多によって労働者及び影響を受ける者が受けた被害は、処置がされ及び/または公正な補償がされている。

NOTE: Standards Developers shall refer to Appendix 1: Personal Protective Equipment (PPE), Medical Biomonitoring, and References By Hazard Groups where current international *Best Available Information** for each of the relevant indicators can be found.

注：規格策定者は、各指標に関する利用可能な最も有効な情報が掲載されている、本文書附則1「危険性グループごとの個人防護具、医学的バイオモニタリング及びその情報源」を参照すること。

4. Indicators for HHPs that meet Hazard Criterion 4 (Mutagenicity)

危険性基準4（突然変異誘発性）を満たすHHPに関する指標

Instructions for Standard Developers:

Standard Developers *shall** refer directly to the following documents where relevant to the HHPs in question or bring the relevant aspects into National Standards. Standard Developers *may** make use of any national interpretations of these documents in laws, regulations, codes of practice, and other governmental guidance.

- Severely Hazardous Pesticides formulations toolkit (sections 4 and 5) (UNEP FAO).
- International tools for preventing local pesticide problems: A consolidated guide to chemical codes and conventions. European Centre on Sustainable Policies for Human and Environmental Rights (ECSPHR), 2008. Chapter 3, section 4.2.5, 4.3.5 and Chapter 6.
- Recognition and management of pesticide Poisonings.6th Edition. 2013. United States Environmental Protection Agency (EPA), Office of Pesticide Programmes. Section I chapter 2, section VI and section VII.
- Global Harmonized System of Classification and Labelling of Chemicals (GHS) 8th Edition. United Nations (UN), New York & Geneva, 2019. Part 3, chapter 3.5.
- International Code of Conduct on Pesticide Management. Guidelines for personal protection when handling and applying pesticides. 9th draft. 2019. FAO & WHO. Part 1, sections 1.1, 1.3, 1.4 and Annex 6.
- Safety and Health in Forestry work. International Labour Office (ILO), Geneva. ILO code of practice. 1998. Part III, Chapters 6, 7 and 9.
- The WHO Recommended Classification of Pesticides by Hazard and guidelines to classification. 2009. World Health Organization (WHO). International Programme on Chemical Safety (IPCS) and Inter-Organization Programme for Sound Management of Chemicals (IOMC). Tables 1,2,3 and 7.

Standard Developers *shall** consider total formulations including active ingredient and inert or co-formulants (e.g. surfactant, wetter, adjuvant, additive).

Standard Developers *shall** prioritize the development of indicators for the identification of harm and identify the required treatment before looking at compensation when it comes to human health.

4.1 *Medical biomonitoring** of *workers** exposed to HHPs that meet these Hazard Criteria is conducted following a methodology based on an analysis of current *Best Available Information**.

これらの危険性基準を満たすHHPに暴露した労働者の医学的バイオモニタリングが、現在利用可能な最も有効な情報の分析に基づく方法に従って行われている。

4.2 Appropriate actions are taken to avoid harm, as identified through the application of the identified *medical biomonitoring** methodology.

特定された医学的バイオモニタリングの方法を通じて特定された、被害を回避・低減するための適切な措置が取られている。

4.3 Health and safety practices for *workers** and *affected stakeholders** are developed and implemented.

労働者及び影響を受ける者の健康と安全に関する対策が構築され、実施されている。

4.4 Harm caused to *workers** and *affected stakeholders** by over-exposure to HHPs in these Hazard Criteria is treated and\or *fair compensation** is provided.

これらの危険性基準に該当するHHPへの暴露過多によって労働者及び影響を受ける者が受けた被害は、処置がされ及び/または公正な補償がされている。

NOTE: Standards Developers shall refer to Appendix 1: Personal Protective Equipment (PPE), Medical Biomonitoring, and References By Hazard Groups where current international *Best Available Information** for each of the relevant indicators can be found.

注：規格策定者は、各指標に関する利用可能な最も有効な情報が掲載されている、本文書附則1「危険性グループごとの個人防護具、医学的バイオモニタリング及びその情報源」を参照すること。

5. Indicators for HHPs that meet Hazard Criterion 5 (Developmental and reproductive toxicity)

危険性基準5（生殖・発生毒性）を満たすHHPに関する指標

INSTRUCTIONS FOR STANDARD DEVELOPERS:

Standard Developers *shall** refer directly to the following documents where relevant to the HHPs in question or bring the relevant aspects into National Standards. Standard Developers *may** make use of any national interpretations of these documents in laws, regulations, codes of practice, and other governmental guidance.

Note: Post 2018 product label will conform to GHS harmonized system of classification and labelling of chemicals (2019)

- Severely Hazardous Pesticides formulations toolkit (sections 4 and 5) (UNEP FAO).
- Safety and Health in Forestry work. International Labour Office (ILO), Geneva. ILO code of practice. 1998. Part III, Chapters 6, 7 and 9.
- The WHO Recommended Classification of Pesticides by Hazard and guidelines to classification. 2009. World Health Organization (WHO), International Programme on Chemical Safety (IPCS) and Inter-Organization Programme for Sound Management of Chemicals (IOMC). Tables 1,2, 3 and 7.
- International Code of Conduct on Pesticide Management. Guidelines for personal protection when handling and applying pesticides. 9th draft. 2019. FAO & WHO. Part 1, sections 1.1, 1.3, 1.4 and Annex 6.
- International Code of Conduct on Pesticide Management. Guidelines on Highly Hazardous f Pesticides FAO &WHO, 2016. Chapters 2,3 and 6.
- Sound and Sustainable Management of Chemicals. A training manual for workers and trade unions. United Nations Environment Programme (UNEP).2008. Module 2.
- Global Harmonized System of Classification and Labelling of Chemicals (GHS) 8th Edition. United Nations (UN), New York & Geneva, 2019. Part 3, Chapter 3.7.
- Recognition and management of pesticide Poisonings.6th Edition. 2013. United States Environmental Protection Agency (EPA), Office of Pesticide Programmes. Section I chapter 2, section VI and section VII.

Standard Developers *shall** consider total formulations including active ingredient and inert or co-formulants (e.g. surfactant, wetter, adjuvant, additive).

Standard Developers *shall** prioritize the development of indicators for the identification of harm and identify the required treatment before looking at compensation when it comes to human health.

5.1 *Medical biomonitoring** of *workers** exposed to HHPs that meet these Hazard Criteria is conducted following a methodology based on an analysis of current *Best Available Information**.

これらの危険性基準を満たすHHPに暴露した労働者の医学的バイオモニタリングが、現在利用可能な最も有効な情報の分析に基づく方法に従って行われている。

5.2 Appropriate actions are taken to avoid harm, as identified through the application of the identified *medical biomonitoring** methodology.

特定された医学的バイオモニタリングの方法を通じて特定された、被害を回避・低減するための適切な措置が取られている。

5.3 Health and safety practices for *workers** and *affected stakeholders** are developed and implemented.

労働者及び影響を受ける者の健康と安全に関する対策が構築され、実施されている。

5.4 Harm caused to *workers** and *affected stakeholder** by over-exposure to HHPs in these Hazard Criteria is treated and\or *fair compensation** is provided.

これらの危険性基準に該当するHHPへの暴露過多によって労働者及び影響を受ける者が受けた被害は、処置がされ及び/または公正な補償がされている。

5.5 NOTE: Standards Developers shall refer to Appendix 1: Personal Protective Equipment (PPE), Medical Biomonitoring, and References By Hazard Groups where current international *Best Available Information** for each of the relevant indicators can be found.

注：規格策定者は、各指標に関する利用可能な最も有効な情報が掲載されている、本文書附則1「危険性グループごとの個人防護具、医学的バイオモニタリング及びその情報源」を参照すること。

6. Indicators for HHPs that meet Hazard Criterion 6 (Endocrine disruption)

危険性基準6（内分泌攪乱物質）を満たすHHPに関する指標

INSTRUCTIONS FOR STANDARD DEVELOPERS:

Standard Developers *shall** refer directly to the following documents where relevant to the HHPs in question or bring the relevant aspects into National Standards. Standard Developers *may** make use of any national interpretations of these documents in laws, regulations, codes of practice, and other governmental guidance.

- Severely Hazardous Pesticides formulations toolkit (sections 4 and 5) (UNEP FAO).
- Safety and Health in Forestry work. International Labour Office (ILO), Geneva. ILO code of practice. 1998. Part III, Chapters 6, 7 and 9.

- Sound and Sustainable Management of Chemicals. A training manual for workers and trade unions. United Nations Environment Programme (UNEP).2008. Module 2.
- The WHO Recommended Classification of Pesticides by Hazard and guidelines to classification. 2009. World Health Organization (WHO), International Programme on Chemical Safety (IPCS) and Inter-Organization Programme for Sound Management of Chemicals (IOMC). Tables 1,2, 3, 4 and 7.
- International Code of Conduct on Pesticide Management. Guidelines for personal protection when handling and applying pesticides. 9th draft. 2019. FAO & WHO. Part 1, sections 1.1, 1.3, 1.4 and Annex 6.
- International Code of Conduct on Pesticide Management. Guidelines on Highly Hazardous Pesticides FAO &WHO, 2016. Chapters 2,3 and 6.
- OECD work on Endocrine Disrupting Chemicals. OECD, 2018. http://oe.cd/endocrine-disrupters
- IPCS International Program of Chemical Safety (WHO) -Integrated Risk Assessment document.
- Global Harmonized System of Classification and Labelling of Chemicals (GHS) 8th Edition. United Nations (UN), New York & Geneva, 2019. Part 3, Chapter 3.9.
- Recognition and management of pesticide Poisonings.6th Edition. 2013. United States Environmental Protection Agency (EPA), Office of Pesticide Programmes. Chapter 21.

Standard Developers *shall** consider total formulations including active ingredient and inert or co-formulants (e.g. surfactant, wetter, adjuvant, additive).

Standard Developers *shall** prioritize the development of indicators for the identification of harm and identify the required treatment before looking at compensation when it comes to human health.

6.1 Medical *biomonitoring** of *workers** exposed to HHPs that meet these Hazard Criteria is conducted following a methodology based on an analysis of current *Best Available Information**.

これらの危険性基準を満たすHHPに暴露した労働者の医学的バイオモニタリングが、現在利用可能な最も有効な情報の分析に基づく方法に従って行われている。

6.2 Appropriate actions are taken to avoid harm, as identified through the application of the identified *medical biomonitoring** methodology.

特定された医学的バイオモニタリングの方法を通じて特定された、被害を回避・低減するための適切な措置が取られている。

6.3 Health and safety practices for *workers** and *affected stakeholders** are developed and implemented.

労働者及び影響を受ける者の健康と安全に関する対策が構築され、実施されている。

6.4 Harm caused to *workers** and *affected stakeholders** by over-exposure to HHPs in these Hazard Criteria is treated and\or *fair compensation** is provided.

これらの危険性基準に該当するHHPへの暴露過多によって労働者及び影響を受ける者が受けた被害は、処置がされ及び/または公正な補償がされている。

NOTE: Standards Developers shall refer to Appendix 1: Personal Protective Equipment (PPE), Medical Biomonitoring, and References By Hazard Groups where current international *Best Available Information** for each of the relevant indicators can be found.

注：規格策定者は、各指標に関する利用可能な最も有効な情報が掲載されている、本文書附則1「危険性グループごとの個人防護具、医学的バイオモニタリング及びその情報源」を参照すること。

Hazard Group Environmental toxicity
危険性グループ：環境毒性

7. Indicators for HHPs that meet Hazard Criterion 7 (Acute toxicity to aquatic organisms)
危険性基準7（水生生物に対する急性毒性）を満たす**HHP**に関する指標

INSTRUCTIONS FOR STANDARD DEVELOPERS:

Standard Developers *shall** refer directly to the following documents where relevant to the HHPs in question or bring the relevant aspects into National Standards. Standard Developers *may** make use of any national interpretations of these documents in laws, regulations, codes of practice, and other governmental guidance.

- Considerations of assessing the risks of combined exposure to multiple chemicals. Series on testing and assessment. No 296. OECD.2018. Chapter 7.
- WHO IPCS Integrated Risk Assessment 2001.
- Acute toxicity risk of pesticides in Hazard Criterion 7, as indicated in the table below:

Algae	High	High	High	High	High	Mod	High	Low
Aquatic invertebrates	High	High	High	High	High	Mod	High	Low
Aquatic plants	High	High	High	High	High	High	High	Low
Fish	Mod	High	High	High	Mod-high	High	Low	Low-high
Non target arthro-pods	Mod	Mod-high	No-mod	Mod-high	Mod-high	Low-mod	Low-high	Low-mod
Earth-worms	Low-high	High	High	High	Low-high	Mod	Low-high	Mod
Birds	Low-mod	Low-high	No-high	No-low	No-high	No-low	No	No-mod
Mammals	Mod	Low-high	No-high	Low	No-high	No-low	No	No-mod
Bees	Low-high	High	High	High	Low-high	Mod	Low-high	Mod

Table 2. Acute toxicity risk of pesticides in Hazard Criterion 7

Standard Developers *shall** consider total formulations including active ingredient and inert or co-formulants (e.g. surfactant, wetter, adjuvant, additive).

7.1 The relevant *trigger values** are identified (see Table 3) that minimize harm to non-target species in aquatic ecosystems for HHPs under Hazard Criterion 7.

危険性基準7に該当するHHPが水界生態系の対象外の種へ与える被害を最小限にする、トリガー値が特定されている（表3参照）。

Category 種類	EU Acute PEC trigger values EUの急性環境中予測濃度トリガー値？	Tropical Acute PEC trigger values 熱帯地域の急性環境中予測濃度トリガー値？	EU TER trigger value EUの毒性暴露比率トリガー値	Tropical TER trigger value 熱帯地域の毒性暴露比率トリガー値
Algae 藻	<0.1	<0.01	100	1000
Aquatic plants 水生植物	<0.01	<0.001	10	100
Aquatic invertebrates 水生無脊椎動物	<0.01	<0.001	10	100
Fish 魚類	<0.01	<0.001	100	1000
Non-target arthropods 対象外節足動物	<0.001	<0.0001	2	20
Earthworms ミミズ	<0.001	<0.0001	10	100
Birds 鳥類	<0.001	<0.0001	10	100
Mammals 哺乳類	<0.001	<0.0001	10	100
Bees ハチ	<0.076	<0.0076	50	500

Table 3. Relevant trigger values for Hazard Criterion 7 & 8.
表3. 危険性基準7&8に関する関連トリガー値

7.2 Protection measures are implemented to avoid exceeding *trigger values**.

トリガー値を超えないように、保護策が実施されている。

7.3 ESRA results are taken into account to implement an environmental biomonitoring program to ensure *trigger values** are not exceeded and has sufficient scope, detail and frequency to detect changes, relative to the initial assessment and status of the *trigger values**.

トリガー値を超えていないことを保証するために環境・社会リスクアセスメント結果が考慮された環境的バイオモニタリングが実施されている。バイオモニタリングは初回の評価からの変化を発見し、トリガー値の状態を確認するために十分な規模、詳細さ頻度で行われている。

NOTE: If your country/region/climate has not developed a *trigger value** (temperate and boreal versus tropical), use LD/LC50 of the relevant pesticides to determine exposure thresholds.

注：国/地域/気候ごとのトリガー値が作成されていない場合（温帯・寒帯対熱帯）、対象農薬のLD/LC50を用いて暴露の閾値を決定すること。

NOTE: LD50 = The **median lethal dose** (or **LD50**) is defined as the dose of a test substance that is lethal for 50% of the animals in a dose group. **LD50** values have been used to compare relative acute hazards of pesticides, especially when no other toxicology data are available for the pesticides.
注：LD50＝半数致死量は、与えられた動物の50%が致死する試験材料の量。LD50は、特に特定の農薬に関する毒物が貴的なデータが他にない場合に、農薬の急性毒性の相対的な比較に使用される。

8. Indicators for HHPs that meet Hazard Criterion 8 (Persistence in soil and water/ biomagnification and bioaccumulation)

危険性基準8（土壌と水への残留性、土壌吸着性、生物濃縮及び生物蓄積）を満たすHHPに関する指標

INSTRUCTIONS FOR STANDARD DEVELOPERS:

Standard Developers *shall** refer directly to the following documents where relevant to the HHPs in question or bring the relevant aspects into National Standards. Standard Developers *may** make use of any national interpretations of these documents in laws, regulations, codes of practice, and other governmental guidance.

- Metabolites impact on non – target arthropods and pollinators
- Ecological monitoring methods for the assessment of pesticides impacts (Grant and Tingle, DFID).
- Considerations of assessing the risks of combined exposures to multiple chemicals. Series on testing and assessment. No 296. OECD, 2018
- WHO IPCS Integrated Risk Assessment, 2001 Chapter 7.
- FOCUS (the forum for co-ordination of pesticide fate models and their use) database – environmental fate – surface and ground water- https://esdac.jrc.ec.europa.eu/projects/focus-dg-sante
- The European soil database v2.0.

Standard Developers *shall** consider total formulations including active ingredient and inert or co-formulants (e.g. surfactant, wetter, adjuvant, additive).

NOTE: For the Boreal zone refer to the same advice as for the Temperate zone

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8.1 The relevant *trigger values** are identified (see Table 3).to detect persistence in soil and water/ biomagnification and bioaccumulation for HHPs under Hazard Criterion 8.

危険性基準8に該当するHHPが土壌と水への残留しているか、/生物濃縮及び生物蓄積しているかを検知するためのトリガー値が特定されている（表3参照）。

8.2 Protection measures are implemented to avoid exceeding *trigger values**.

トリガー値を超えないように、保護策が実施されている。

8.3 ESRA results are taken into account to implement an environmental biomonitoring program to ensure *trigger values** are not exceeded and has sufficient scope, detail and frequency to detect changes, relativeto the initial assessment and status of the *trigger values**.

トリガー値を超えていないことを保証するために環境・社会リスク

アセスメント結果が考慮された環境的バイオモニタリングが実施されている。バイオモニタリングは初回の評価からの変化を発見し、トリガー値の状態を確認するために十分な規模、詳細さ頻度で行われている。

NOTE: If your country/region/climate has not developed a *trigger value** (temperate and boreal versus tropical), use LD/LC50 of the relevant pesticides to determine exposure thresholds.

注：国/地域/気候ごとのトリガー値が作成されていない場合（温帯・寒帯対熱帯）、対象農薬のLD/LC50を用いて暴露の閾値を決定すること。

NOTE: LD50 = The **median lethal dose** (or **LD50**) is defined as the dose of a test substance that is lethal for 50% of the animals in a dose group. **LD50** values have been used to compare relative acute hazards of pesticides, especially when no other toxicology data are available for the pesticides.
注：LD50＝半数致死量は、与えられた動物の50%が致死する試験材料の量。LD50は、特に特定の農薬に関する毒物が貴的なデータが他にない場合に、農薬の急性毒性の相対的な比較に使用される。

Hazard Group Dioxins

危険性グループ：ダイオキシン

9. Indicators for HHPs that meet Hazard Criterion 9 (Dioxins (residues or emissions))

危険性基準9（ダイオキシン（残留または排出））を満たすHHPに関する指標

INSTRUCTIONS FOR STANDARD DEVELOPERS:

Standard Developers *shall** refer directly to the following documents where relevant to the HHPs in question or bring the relevant aspects into National Standards. Standard Developers *may** make use of any national interpretations of these documents in laws, regulations, codes of practice, and other governmental guidance.

- Severely Hazardous Pesticides formulations toolkit (sections 4 and 5) (UNEP FAO).
- ILO Safety in the use of chemicals at work
- IPCS International Program of Chemical Safety (WHO) -Integrated Risk Assessment document
- International Code of Practice for use of pesticides (WHO)
- Strategic Approach to International Chemicals management (UNEP)
- Global Harmonized System of Classification and Labelling of Chemicals (GHS) 8th Edition. United Nations (UN), New York & Geneva, 2019. Part 3, Chapter 3.8
- Recognition and management of pesticide Poisonings.6th Edition. 2013. United States Environmental Protection Agency (EPA), Office of Pesticide Programmes. Chapter 21

Standard Developers *shall** consider total formulations including active ingredient and inert or co-formulants (e.g. surfactant, wetter, adjuvant, additive).

Standard Developers *shall** prioritize the development of indicators for the identification of harm and identify the required treatment before looking at compensation when it comes to human health.

9.1 When HHPs that meet Hazard Criteria 9 are used, Annex 3. Procedure for the exceptional use of FSC prohibited HHPs in FSC-POL-30-001 FSC Pesticides Policy is applied.

危険性基準9を満たすHHPが使用される際には、FSC-POL-30-001 FSC農薬指針の附則3 FSC禁止HHPの例外的な使用に関する手順が適用される。

9.2 *Medical biomonitoring** of *workers** exposed to HHPs that meet these Hazard Criteria is conducted following a methodology based on an analysis of current Best Available Information*.

これらの危険性基準を満たすHHPに暴露した労働者の医学的バイオモニタリングが、現在利用可能な最も有効な情報の分析に基づく方法に従って行われている。

9.3 Appropriate actions are taken to avoid harm, as identified through the application of the identified *medical biomonitoring** methodology.

特定された医学的バイオモニタリングの方法を通じて特定された、被害を回避・低減するための適切な措置が取られている。

9.4 Health and safety practices for *workers** and *affected stakeholders** are developed and implemented.

労働者及び影響を受ける者の健康と安全に関する対策が構築され、実施されている。

9.5 Harm caused to *workers** and *affected stakeholders** by over-exposure to HHPs in these Hazard Criteria is treated and\or *fair compensation** is provided.

これらの危険性基準に該当するHHPへの暴露過多によって労働者及び影響を受ける者が受けた被害は、処置がされ及び/または公正な補償がされている。

NOTE: Standards Developers shall refer to Appendix 1: Personal Protective Equipment (PPE), Medical Biomonitoring, and References By Hazard Groups where current international *Best Available Information** for each of the relevant indicators can be found.

注：規格策定者は、各指標に関する利用可能な最も有効な情報が掲載されている、本文書附則1「危険性グループごとの個人防護具、医学的バイオモニタリング及びその情報源」を参照すること。

Hazard Group Heavy Metals
危険性グループ：重金属

10. Indicators for HHPs that meet Hazard Criterion 10 (Heavy metals (arsenic, cadmium, lead, and mercury)
危険性基準10（重金属（ヒ素、カドミウム、鉛、水銀））を満たすHHPに関する指標

INSTRUCTIONS FOR STANDARD DEVELOPERS:

Standard Developers *shall** refer directly to the following documents where relevant to the HHPs in question or bring the relevant aspects into National Standards. Standard Developers *may** make use of any national interpretations of these documents in laws, regulations, codes of practice, and other governmental guidance.

- ILO Safety in the use of chemicals at work
- IPCS International Program of Chemical Safety (WHO) Integrated Risk Assessment document
- International Code of Practice for use of pesticides (WHO)
- Strategic Approach to International Chemicals management (UNEP)
- Global Harmonized System of Classification and Labelling of Chemicals (GHS) 8th Edition. United Nations (UN), New York & Geneva, 2019. Part 3, Part 4
- Recognition and management of pesticide Poisonings.6th Edition. 2013. United States Environmental Protection Agency (EPA), Office of Pesticide Programmes. Section I and Chapter 21.
- FOCUS (the forum for co-ordination of pesticide fate models and their use) database – environmental fate – surface and ground water- https://esdac.jrc.ec.europa.eu/projects/focus-dg-sante
- The European soil database v2.0.

Standard Developers *shall** consider total formulations including active ingredient and inert or co-formulants (e.g. surfactant, wetter, adjuvant, additive).

Standard Developers *shall** prioritize the development of indicators for the identification of harm and identify the required treatment before looking at compensation when it comes to human health.

10.1 When HHPs that meet Hazard Criteria 10 are used, Annex 3. Procedure for the exceptional use of FSC prohibited HHPs in FSC-POL-30-001 FSC Pesticides Policy is applied.

危険性基準10を満たすHHPが使用される際には、FSC-POL-30-001 FSC農薬指針の附則3 FSC禁止HHPの例外的な使用に関する手順が適用される。

10.2 *Medical biomonitoring** of workers exposed to HHPs that meet these Hazard Criteria is conducted following a methodology based on an analysis of current *Best Available Information**.

これらの危険性基準を満たすHHPに暴露した労働者の医学的バイオモニタリングが、現在利用可能な最も有効な情報の分析に基づく方法に従って行われている。

10.3 Appropriate actions are taken to avoid harm, as identified through the application of the identified medical biomonitoring* methodology.

特定された医学的バイオモニタリングの方法を通じて特定された、被害を回避・低減するための適切な措置が取られている。

10.4 Health and safety practices for *workers** and *affected stakeholders** are developed and implemented.

労働者及び影響を受ける者の健康と安全に関する対策が構築され、実施されている。

10.5 Harm caused to *workers** and *affected stakeholders** by over-exposure to HHPs in these Hazard Criteria is treated and\or *fair compensation** is provided.

これらの危険性基準に該当するHHPへの暴露過多によって労働者及び影響を受ける者が受けた被害は、処置がされ及び/または公正な補償がされている。

NOTE: Standards Developers shall refer to Appendix 1: Personal Protective

Equipment (PPE), Medical Biomonitoring, and References By Hazard Groups where current international *Best Available Information** for each of the relevant indicators can be found.

注：規格策定者は、各指標に関する利用可能な最も有効な情報が掲載されている、本文書附則1「危険性グループごとの個人防護具、医学的バイオモニタリング及びその情報源」を参照すること。

Appendix 1: PERSONAL PROTECTIVE EQUIPMENT (PPE), MEDICAL BIOMONITORING, AND REFERENCES BY HAZARD GROUPS

This table provides summary information by Hazard Group/Criterion and is intended to be a "Quick Reference" for determining PPE needs for chemical use. Standard Development Groups shall use this information for developing the national indicators to the target HHPs. Medical Biomonitoring information is also provided for that purpose.

Note for public consultation
The TWG is providing additional guidance to Biomonitoring for Standard Development Group. Please see page 29 of synopsis report, Annex 3. *Guide to biomonitoring needed according to FSC Pesticides Policy Hazard Criterion*.

Column titles and explanations: "Sub-set of Chemicals in Hazard Group" is a partial listing of chemical in a Hazard Group. For a full and complete list of chemicals in any Hazard Group see the most current version of FSC-POL-30-001a. Hazard Group and Criterion are as described in FSC-POL-30-001. Personal Protective Equipment (PPE) is compiled from literature cited in the "References" column. Classification is from FAO & WHO International Code of Conduct on Pesticide Management: Guidelines for Personal Protection when Handling and Applying Pesticides, 2020. "Medical Biomonitoring" and "Frequency and Duration" are from "WHO Human Biomonitoring Guide for Exposure in the Workplace, Vol.1, 1996" and various others including the listed references.

NOTE: Frequency and Duration

1. How the hours worked are calculated.
   The hours are based on a 5-day working week (averaging 8 hours per day) and an average of 21 working days a month resulting in approximately 220 working days per year. The hours worked are based on working those hours consistently in those categories to facilitate the ADI to be exceeded, only then the exposure to the pesticide will need to be tested and monitored to ensure human health is protected.

2. Before and after spraying.
   Before spraying means when the spray operator is new to the spray programme and before they apply the first pesticide for any CH, they need to be tested to calculate a baseline of what pesticide load already exists in their body. These results need to be kept on file to compare any future results to. If the spray operator works for multiple CH's, they need to keep their biomonitoring file with them so that they can notify each CH that they have been tested. They ned to keep track of their hours sprayed and notify and

relevant CH of the hours they have already sprayed. They do not need to get initial testing at the CH, only the first CH. Once they get to the next threshold where they need to be tested, they need to notify the relevant CH that they need to be tested prior to starting the spray programme at the relevant CH. For example, they are spraying an organophosphate and they are reaching 115 hours in one month, they will need to go for an additional test.
After spraying means once the spray operator has decided that they no longer want to be active in any spray operations (they retire, change job categories or work opportunities) they need to be tested so that their closing pesticide load is measured. These records/tests need to be kept on file for 5-10 years.

Sub-set of Chemicals in Hazard Group	**Hazard Group**	**Hazard Criterion**	**Personal Protective Equipment (PPE)**		**Classification**	**Medical Biomonitoring*** **NOTE: These are the least expensive/most accessible options.**	**Frequency and Duration**	**References**
Organochlorines/ chlorinated hydrocarbons (DDT, Endosulfan, Atrazine, Vinclozolin, TBT, Aldrin, Chlordane, Endrin, Heptachlor, Chlordecone, Lindane, Toxaphene, Hexachlorobenzene, Mirex)	1	Relevant International Agreements or Conventions **GHS06 DANGER**  H300, H301 H310, H311, H330, H331, **GHS05 DANGER**	1. Butyl rubber gloves 2. Type 3 protective clothing (liquid tight)  Type 4 protective clothing (spray tight) 	 	EN 374:2016 EN 14605: 2005 EN 14605:2005	**Whole blood tests** 1cc blood anti-coagulated in sodium hepalin (refrigerated) . Analyse with Comet Assay	**Organochlorines, CHC's & PICS: Using whole blood** 1. Before the beginning of the spraying for all groups a blood sample needs to be taken : a. If the worker sprays less than 40 hours per month – additional testing not necessary	Yusa *et al.*, 2015 (https://dx.doi.org/10.1016/j.aca.2015.05.032) Sannolo *et al.*, 1999 (https://doi.org/10.1002/(SICI)1096-9888(199910)34:10%3c1028::AID-JMS861%3e3.0.CO;2-H))

Sub-set of Chemicals in Hazard Group	Hazard Group	Hazard Criterion	Personal Protective Equipment (PPE)		Classification	Medical Biomonitoring* **NOTE: These are the least expensive/most accessible options.**	Frequency and Duration	References
PICS (Annexure III) (2,4,5-T, Aldrin, Benomyl, Binapacryl, Captafol, Carbofuran, Chlrodane, Chlorobenzilate, DDT, Dieldrin, Dinoseb, DNOC, DNOC ammonium salt, DNOC potassium salt, DNOC sodium salt, Ethylene dibromide, Ethylene dichloride, Ethylene oxide, Fluoroacetamide, Heptachlor, Hexachlorobenz	1	 H290, H314, H318 **GHS07 WARNIING**  Ozone depleting H420	Type 5 protective clothing (airborne particles)  Type 6 protective clothing (chemical splash)  3. Safety boots 4. Full face respirators	  	BS EN ISO 13982:2004 EN 13034 EN 345:1993 EN ISO 20345 EN 136 EN 141:2000	Or use field-based test kit **Hair test** 50-200mg hair sample, cleaned and frozen Analyse with GC-LS	b. If the worker sprays between 40 and 115 hours per month (1h/d) – additional testing not necessary c. If the worker sprays between 115 and 575 hours per month (5h/d) then additional testing is required once per year d. If the worker sprays between 575 and 920 hours per month (8h/d) then additional testing is required every 3-6 months 2. All workers active in the spraying programme need test	Doganlar *et al*., 2018 (https://doi.org/10.1007/s00244-018-0545-7) WHO, 1996. Biological monitoring of chemical exposure in the workplace. Guidelines, volume 1, Chapter 5.1. https://apps.who.int/iris/bitstream/handle/10665/41856/WHO_HPR_OCH_96.1.pdf?sequence=1&isAllowed=y WHO, 2012. Biomonitoring-based indicators of exposure to chemical pollutants. Pg 20, 22,

Sub-set of Chemicals in Hazard Group	Hazard Group	Hazard Criterion	Personal Protective Equipment (PPE)		Classification	Medical Biomonitoring* **NOTE: These are the least expensive/most accessible options.**	Frequency and Duration	References
ene, Hexachlorocyclohexane, Lindane, Mercury, Methamidaphos, Monocrotophos, Paraquat dichloride, Parathion-methyl, PCP, Phophamidon, Thiram, Toxaphene, Z-Phosphamidon)			Full face respirators for vapours and gases. 5. Particulate air filters for respirators. 6. Apron		P95, P99, P100 EN 467:1995		once they leave the spray programme or are no longer active in the spray programme **Methyl bromide**: 1.Hair sample to be taken before spraying commences- before the worker is active in the spray programme 2.Hair sample to be taken when the worker leaves or is no longer active in the spray programme	
Methyl bromide	1							
Bupyridyls (Paraquat, Paraquat dibromide,	2	Acute toxicity to mammals and birds **GHS06 DANGER**	1. Chemically resistant nitrile gloves 2. Type 3 and type 4		EN 374:2016	**Urine tests** 5cc fresh urine sample, refrigerated. Tested using ELIZA test. –	**Urine tests:** 1.Before the spraying a urine test needs to be taken for all groups:	Yusa *et al.*, 2015 (https://dx.doi.org/10.1016/j.aca.2015.05.032)

Sub-set of Chemicals in Hazard Group	Hazard Group	Hazard Criterion	Personal Protective Equipment (PPE)	Classification	Medical Biomonitoring* **NOTE: These are the least expensive/most accessible options.**	Frequency and Duration	References
Diquat, Diquat dibromide)		 H330, H301 H310, H311 H330, H331 **GHS07 WARNING**  H302, H312 H332, H315 H317, H319 **GHS05 DANGER**  H314, H318	protective clothing   3. Safety boots 4. Face and Eye protection (safety goggles) 5. Half face respirators 6. Particulate air filters for respirators	   	EN14605:2005 EN 345:1993 N ISO 20345 EN 166: 2001 EN 140, EN 149 EN 143: 2000 R95, R99, R100	dipstick test (field-tests available) **AChE tests (done on urine)** Test done as indicated with unit - mobile field unit- AChE check Control unit from Securetec : www.securetec.net Testmate-400	a. If the worker sprays less than 40 hours per month – an additional test is not necessary b. If the worker sprays between 40 and 115 hours per month (1h/d) – an additional test is not necessary c. If a worker sprays between 115 and 575 hours per month (5h/d) an additional test is not necessary d. If a worker sprays between 575 and 920 hours per month (8h/d) – an additional	WHO, 1996. Biological monitoring of chemical exposure in the workplace. Guidelines, volume 1, Chapter 5.1. https://apps.who.int/iris/bitstream/handle/10665/41856/WHO_HPR_OCH_96.1.pdf?sequence=1&isAllowed=y WHO, 2012. Biomonitoring-based indicators of exposure to chemical pollutants. Pg 20, 22,

Sub-set of Chemicals in Hazard Group	Hazard Group	Hazard Criterion	Personal Protective Equipment (PPE)		Classification	Medical Biomonitoring* **NOTE: These are the least expensive/most accessible options.**	Frequency and Duration	References
			7.Apron		EN 467: 1995		test is needed once a year 2. All workers active in the spraying programme need test once they leave the spray programme or are	
Neonicotinoids (Acetamiprid, Clothianidin, Dinotefuran, Imidacloprid, Desmethyl acetamiprid, Nitenpyram, Thiacloprid, Thiamethoxam)	2	Acute toxicity to mammals and birds **GHS05 DANGER**  H314, H318 **GHS06 DANGER**  H300,H301	1.Neoprene glove 2.Type 3 & Type 4 protective clothing   Type 5 protective clothing 	 	EN 374:2016 EN14605:2005 BS EN ISO 13982: 2004	**Urine tests** 5cc fresh urine sample refrigerated. Tested in laboratory using Nexera liquid chromatography system coupled with Triple Quad	**Urine tests:** 1.Before the spraying a urine test needs to be taken for all groups: a.If the worker sprays less than 40 hours per month – an additional test is not necessary b. If the worker sprays between 40 and 115	Calderon-Segura et al., 2011. (https://dx.doi.org/10.1155/2012/612647) Yusa *et al*., 2015 (https://dx.doi.org/10.1016/j.aca.2015.05.032) Vikkey et al., 2017 (http://doi.org/10/1177/117786302177046 59)

Sub-set of Chemicals in Hazard Group	Hazard Group	Hazard Criterion	Personal Protective Equipment (PPE)		Classification	Medical Biomonitoring* **NOTE: These are the least expensive/most accessible options.**	Frequency and Duration	References
	4 8	H310,H311 H330, H331 **GHS07 WARNING**  H302, H312 H332, H315 H317, H319 <u>Mutagenicity to mammals</u> **GHS08 DANGER**  H340, H341 <u>Persistence in soil/water and</u>	3. Safety boots 4. Face & eye protection 5. Half respirator 6. Particulate filters for respirators 7. Apron	   	EN 345:1993 EN ISO 20345 EN 166:2001 EN 140 EN149 EN143: 2000 R95, R99, R100 EN 467: 1995	6500 mass spectometer	hours per month (1h/d) – an additional test is not necessary c. If a worker sprays between 115 and 575 hours per month (5h/d) an additional test is not necessary d. If a worker sprays between 575 and 920 hours per month (8h/d) – an additional test is needed once a year 2. All workers active in the spraying programme need test once they leave the spray programme or are	Jakubokski 2012 (https://dx.doi.org/10.1039/c1em10706b) Harada *et al*., 2016. (https://dx.doi.org/10.1371/journal.pone.0146335) WHO, 1996. Biological monitoring of chemical exposure in the workplace. Guidelines, volume 1, Chapter 5.1. https://apps.who.int/iris/bitstream/handle/10665/41856/WHO_HPR_OCH_96.1.pdf?sequence=1&isAllowed=y WHO, 2012. Biomonitoring-based

Sub-set of Chemicals in Hazard Group	Hazard Group	Hazard Criterion	Personal Protective Equipment (PPE)		Classification	Medical Biomonitoring* **NOTE: These are the least expensive/most accessible options.**	Frequency and Duration	References
		soil absorption potential & biomagnification & bioaccumulation **GHS09 WARNING**  H410, H411 H412, 4413 Environment					*if acetamiprid or imidacloprid are used, then testing will be needed for c. as the excretion rate is very slow thus bioaccumulation may occur	indicators of exposure to chemical pollutants. Pg 20, 22,
Pyrethroids (Cyfluthrin. Cypermethrin, Deltamethrin, Permethrin, Phenoxyalkyl acids Amides (Acetachlor, Alachlor, Amicarbazone,	2	Acute toxicity to mammals and birds **GHS06 DANGER**  H300, H301, H310, H311,	1. Neoprene gloves/ chemically resistant gloves 2. Type 3 & 4 protective clothing	 	EN 374:2016 EN 14605: 2005 EN 345:1993 EN ISO 20345	**Urine tests** 5cc fresh urine sample refrigerated. Tested using ELISA test (dipstick test) 60cc needed for testing in	**Urine tests for Pyrethroids, Phenoxyalkyl acids & amides:** 1.Before the spraying a urine test needs to be taken for all groups:	Ungerer, Ewers & Wilhelm, 2007 (https://doi.org/10.1016/j.ijheh.2007.01.024) Calafat *et al*., 2017 (http://dx.doi.org/10/1016/j.ijheh.2016.10.008)

Sub-set of Chemicals in Hazard Group	Hazard Group	Hazard Criterion	Personal Protective Equipment (PPE)	Classification	Medical Biomonitoring* **NOTE: These are the least expensive/most accessible options.**	Frequency and Duration	References
Asulam, beflubutamid, Butachlor, Chlorthiamid, Diflufenicam, Dimetachlor, Dimethenamid, Etabenzanid, Fentrazamide, Flufenacet, Metazachlor, Metolachlor, Propachlor, Propanid, Tebutam) 3	H330, H331 **GHS07 WARNING**  H302, H312, H332, H315, H317, H319 **GHS05 DANGER**  H314, H318 <u>Carcinogenicity</u> **GHS07 WARNING** 	 3. Safety boots 4. Face & eye protection (safety goggles) 5. Half-face respirators 6. Particulate air filters for respirators 7. Apron		EN 166:2001 EN 140 EN 149 EN 143:2000 R95, R99, R100 EN 467: 1995	children. (dip stick) **AChE tests** AChE tests done when necessary with Test-Mate model 400 device or field testing with AChE check Control device from Securetec obtainable from www.securetec.net	a. If the worker sprays less than 40 hours per month – an additional test is not necessary b. If the worker sprays between 40 and 115 hours per month (1h/d) – an additional test is not necessary c. If a worker sprays between 115 and 575 hours per month (5h/d) an additional test is needed every 2 years d. If a worker sprays between 575 and 920 hours per month (8h/d) – an additional	Yusa *et al.*, 2015 (https://dx.doi.org/10.1016/j.aca.2015.05.032) Esteban & Castano, 2009 (https://doi.org/10.1016/j.envint.2008.09.003) CDC National Biomonitoring Programme https://www.cdc.gov/biomonitoring/Cyfluthrin_Cypermethrin_Permethrin_BiomonitoringSummary.html# Leng *et al.*, 1997. (PII S0048-9697(97)05493-4)

Sub-set of Chemicals in Hazard Group	Hazard Group	Hazard Criterion	Personal Protective Equipment (PPE)	Classification	Medical Biomonitoring* **NOTE: These are the least expensive/most accessible options.**	Frequency and Duration	References
	4 6	H335, H336 **GHS08 DANGER**  H334, H350 H350i, H350I <u>Mutagenicity to humans</u> GHS08 DANGER  H340, H341 <u>Endocrine Disrupting Chemicals (EDC)</u> **GHS08 DANGER**				test is needed once a year 2. All workers active in the spraying programme need to be tested once they leave the spray programme or are no longer active in the spraying programme	

Sub-set of Chemicals in Hazard Group	Hazard Group	Hazard Criterion	Personal Protective Equipment (PPE)		Classification	Medical Biomonitoring* **NOTE: These are the least expensive/most accessible options.**	Frequency and Duration	References
		 H370, H371 H372, H373						
Carbamates 1.Thiocarbamates	3 7	<u>Carcinogenicity</u> **GHS07 WARNING**  H335, H336 **GHS08 DANGER**  H334, H350 H350i, H350I <u>Acute toxicity to aquatic organisms</u>	1. Neoprene gloves/ chemically resistant gloves 2. Type 3 & 4 protective clothing  3. Safety boots	   	EN 374:2016 EN 14605: 2005 EN 345:1993 EN ISO 20345 EN 166:2001 EN 140 EN 149	**Urine tests** 5cc fresh urine sample refrigerated. Tested using ELISA test – dipstick test 60cc needed for testing in children. (dip stick) **AChE tests** AChE tests done when needed with Test-Mate model 400 device or	**Urine tests for Carbamates:** 1. Before the spraying a urine test needs to be taken for all groups: a. If the worker sprays less than 40 hours per month – an additional test is not necessary b. If the worker sprays between 40 and 115 hours per month (1h/d) – an additional test is not necessary	Calderon-Segura et al., 2011. (https://dx.doi.org/10.1155/2012/612647) Ungerer, Ewers & Wilhelm, 2007 (https://doi.org/10.1016/j.ijheh.2007.01.024) Calafat *et al*., 2017 (http://dx.doi.org/10/1016/j.ijheh.2016.10.008) Yusa *et al*., 2015 (https://dx.doi.org/10.1016/j.aca.2015.05.032)

Sub-set of Chemicals in Hazard Group	Hazard Group	Hazard Criterion	Personal Protective Equipment (PPE)		Classification	Medical Biomonitoring* **NOTE: These are the least expensive/most accessible options.**	Frequency and Duration	References
		GHS09 WARNING  H400 Environment	4. Face & eye protection (safety goggles) 5. Half-face respirators 6. Particulate air filters for respirators 7. Apron	 	EN 143:2000 R95, R99, R100 EN 467: 1995	field testing with AChE check Control device from Securetec obtainable from www.securetec.net	c. If a worker sprays between 115 and 575 hours per month (5h/d) an additional test is needed every year d. If a worker sprays between 575 and 920 hours per month (8h/d) – an additional test is needed every 3-6 months 2. All workers active in the spraying programme need to be tested once they leave the spray programme or are no longer active in the spraying programme	Esteban & Castano, 2009 (https://doi.org/10.1016/j.envint.2008.09.003) Vikkey et al., 2017 (http://doi.org/10/1177/117786302177046 59) WHO, 1996. Biological monitoring of chemical exposure in the workplace. Guidelines, volume 1, Chapter 5.1. https://apps.who.int/iris/bitstream/handle/10665/41856/WHO_HPR_OCH_96.1.pdf?sequence=1&isAllowed=y

Sub-set of Chemicals in Hazard Group	Hazard Group	Hazard Criterion	Personal Protective Equipment (PPE)	Classification	Medical Biomonitoring* **NOTE: These are the least expensive/most accessible options.**	Frequency and Duration	References
Organophosphates	2	Acute toxicity to mammals and birds **GHS05 DANGER**  H314, H318 **GHS06 DANGER**  H300,H301 H310,H311 H330, H331 **GHS07 WARNING** 	1. Neoprene gloves / chemically resistant nitrile gloves 2. Type 3 & Type 4 protective clothing  Type 5 protective clothing  3. Safety boots 4. Face & eye protection 	EN 374:2016 EN 14605: 2005 EN 345:1993 EN ISO 20345 EN 166:2001 EN 140 EN 149	**Urine tests** 5cc fresh urine sample refrigerated. Tested using ELISA test. – dipstick test 60cc needed for testing in children. (dip stick) **AChE tests for blood samples** AChE tests done when necessary with Test-Mate model 400 device or field testing with AChE	**Urine tests for Organophosphates:** 1. Before the spraying a urine test needs to be taken for all groups: a. If the worker sprays less than 40 hours per month – an additional test is not necessary b. If the worker sprays between 40 and 115 hours per month (1h/d) – an additional test is not necessary c. If a worker sprays between 115 and 575 hours per month (5h/d) an additional	Yusa *et al.*, 2015 (https://dx.doi.org/10.1016/j.aca.2015.05.032) Esteban & Castano, 2009 (https://doi.org/10.1016/j.envint.2008.09.003) Ungerer, Ewers & Wilhelm, 2007 (https://doi.org/10.1016/j.ijheh.2007.01.024) Doganlar et al., 2018 (https://doi.org/10.1007/s00244-018-0545-7)

Sub-set of Chemicals in Hazard Group	Hazard Group	Hazard Criterion	Personal Protective Equipment (PPE)		Classification	Medical Biomonitoring* **NOTE: These are the least expensive/most accessible options.**	Frequency and Duration	References
	3 4	H302, H312 H332, H315 H317, H319 Carcinogenicity **GHS07 WARNING**  H335, H336 **GHS08 DANGER**  H334, H350, H350i, H350I Mutagenicity to mammals **GHS08 DANGER**	5. Half respirator 6. Particulate filters for respirators 7. Apron	 	EN 143:2000 R95, R99, R100 EN 467: 1995	check Control device from Securetec obtainable from www.securetec.net	test is needed every year d. If a worker sprays between 575 and 920 hours per month (8h/d) – an additional test is needed every 3-6 months 2. All workers active in the spraying programme need to be tested once they leave the spray programme or are no longer active in the spraying programme	Calafat *et al*., 2017 (http://dx.doi.org/10.1016/j.ijheh.2016.10.008) (https://doi.org/10.1-16/j.ijheh.2016.10.008) Calderon-Segura et al., 2011. (https://dx.doi.org/10.1155/2012/612647) Vikkey et al., 2017 (http://doi.org/10/1177/117786302177046 59) WHO, 1996. Biological monitoring of chemical exposure in the workplace.

Sub-set of Chemicals in Hazard Group	Hazard Group	Hazard Criterion	Personal Protective Equipment (PPE)		Classification	Medical Biomonitoring* **NOTE: These are the least expensive/most accessible options.**	Frequency and Duration	References
	5 6	 H340,H341 Developmental and Reproductive toxicity GHS08 DANGER  H360, H360F H360D, H360FD H361, H361f, H361d, H361fd H362 Endocrine Disrupting Chemicals (EDC)						Guidelines, volume 1, Chapter 5.1. https://apps.who.int/iris/bitstream/handle/10665/41856/WHO_HPR_OCH_96.1.pdf?sequence=1&isAllowed=y

Sub-set of Chemicals in Hazard Group	Hazard Group	Hazard Criterion	Personal Protective Equipment (PPE)		Classification	Medical Biomonitoring* **NOTE: These are the least expensive/most accessible options.**	Frequency and Duration	References
	7	**GHS08 DANGER**  H370, H371 H372, H373 Acute toxicity to aquatic organisms **GHS09 WARNING**  H400 Environment						
Carbamates 2.Dithiocarbamates	2	Acute toxicity to mammals and birds **GHS05 DANGER**	1.Neoprene gloves / chemically resistant nitrile gloves		EN 374:2016	**Urine tests** 5cc fresh urine sample refrigerated. Tested using	**Urine tests for carbamates:** 1.Before the spraying a urine test needs to	Yusa *et al.*, 2015 (https://dx.doi.org/10.1016/j.aca.2015.05.032)

Sub-set of Chemicals in Hazard Group	Hazard Group	Hazard Criterion	Personal Protective Equipment (PPE)	Classification	Medical Biomonitoring* **NOTE: These are the least expensive/most accessible options.**	Frequency and Duration	References
	5	 H314, H318 **GHS06 DANGER**  H300,H301 H310,H311 H330, H331 **GHS07 WARNING**  H302, H312 H332, H315 H317, H319	2. Type 3 & Type 4 protective clothing  Type 5 protective clothing  3. Safety boots 4. Face & eye protection	    	EN 14605: 2005 EN 345:1993 EN ISO 20345 EN 166:2001 EN 140 EN 149 EN 143:2000	ELISA test. – dipstick test 60cc needed for testing in children. (dip stick) **AChE tests** AChE tests done when necessary with Test-Mate model 400 device or field testing with AChE check Control device from Securetec obtainable from	be taken for all groups: a. If the worker sprays less than 40 hours per month – an additional test is not necessary b. If the worker sprays between 40 and 115 hours per month (1h/d) – an additional test is not necessary c. If a worker sprays between 115 and 575 hours per month (5h/d) an additional test is needed every year d. If a worker sprays between 575 and 920	Esteban & Castano, 2009 (https://doi.org/10.1016/j.envint.2008.09.003) Ungerer, Ewers & Wilhelm, 2007 (https://doi.org/10.1016/j.ijheh.2007.01.024) Doganlar et al., 2018 (https://doi.org/10.1007/s00244-018-0545-7) Calafat *et al*., 2017 (http://dx.doi.org/10/1016/j.ijheh.2016.10.008)

Sub-set of Chemicals in Hazard Group	Hazard Group	Hazard Criterion	Personal Protective Equipment (PPE)		Classification	Medical Biomonitoring* **NOTE: These are the least expensive/most accessible options.**	Frequency and Duration	References
	6 7	Developmental and Reproductive toxicity GHS08 DANGER  H360, H360F H360D, H360FD H361, H361f, H361d, H361d H362 Endocrine Disrupting Chemicals (EDC) **GHS08 DANGER** 	5. Half respirator 6. Particulate filters for respirators 7. Apron		R95, R99, R100 EN 467: 1995	www.securetec.net	hours per month (8h/d) – an additional test is needed every 3-6 months 2. All workers active in the spraying programme need to be tested once they leave the spray programme or are no longer active in the spraying programme	Calderon-Segura et al., 2011. (https://dx.doi.org/10.1155/2012/612647) Vikkey et al., 2017 (http://doi.org/10/1177/117786302177046 59) WHO, 1996. Biological monitoring of chemical exposure in the workplace. Guidelines, volume 1, Chapter 5.1. https://apps.who.int/iris/bitstream/handle/10665/41856/WHO_HPR_OCH_96.1.pdf?sequence=1&isAllowed=y

Sub-set of Chemicals in Hazard Group	Hazard Group	Hazard Criterion	Personal Protective Equipment (PPE)		Classification	Medical Biomonitoring* **NOTE: These are the least expensive/most accessible options.**	Frequency and Duration	References
		H370, H371 H372, H373 Acute toxicity to aquatic organisms **GHS09** **WARNING**  H400 Environment						
Di-nitro anilines (Benfluralin, Butralin, Chlornidine, Dipropalin, Ethalfluralin, Fluchloralin, Isopropalin, Methalpropalin,	3	Carcinogenicity **GHS07** **WARNING**  H335, H336	1. Neoprene gloves / chemically resistant nitrile gloves 2. Type 3 & Type 4	 	EN 374:2016 EN 14605: 2005 EN 345:1993	**Urine tests** 5cc fresh urine sample refrigerated. ELIZA dipstick test 60cc needed for testing in	**Urine tests for Di-nitro anilines:** 1.Before the spraying a urine test needs to be taken for all groups:	Ungerer, Ewers & Wilhelm, 2007 (https://doi.org/10.1016/j.ijheh.2007.01.024) Doganlar et al., 2018

Sub-set of Chemicals in Hazard Group	Hazard Group	Hazard Criterion	Personal Protective Equipment (PPE)		Classification	Medical Biomonitoring* **NOTE: These are the least expensive/most accessible options.**	Frequency and Duration	References
Nitralin, Oryzalin, Pendimethalin, Prodiamine, Profluralin, Trifluralin)	6 8	**GHS08 DANGER** H334, H350 H350i, H350l Endocrine Disrupting Chemicals (EDC) **GHS08 DANGER** H370, H371 H372, H373 Persistence in soil/water and soil absorption potential &	protective clothing Type 5 protective clothing 3. Safety boots 4. Face & eye protection 5. Half respirator		EN ISO 20345 EN 166:2001 EN 140 EN 149 EN 143:2000 R95, R99, R100	children. (dip stick) **AChE tests** AChE tests done when necessary with Test-Mate model 400 device or field testing with AChE check Control device from Securetec obtainable from www.securetec.net	a. If the worker sprays less than 40 hours per month – an additional test is not necessary b. If the worker sprays between 40 and 115 hours per month (1h/d) – an additional test is not necessary c. If a worker sprays between 115 and 575 hours per month (5h/d) an additional test is needed every 2 years d. If a worker sprays between 575 and 920 hours per month (8h/d) – an additional	(https://doi.org/10.1007/s00244-018-0545-7) Calafat *et al*., 2017 (http://dx.doi.org/10.1016/j.ijheh.2016.10.008) Calderon-Segura et al., 2011. (https://dx.doi.org/10.1155/2012/612647) Vikkey et al., 2017 (http://doi.org/10/1177/117786302177046 59) Yusa *et al*., 2015

Sub-set of Chemicals in Hazard Group	Hazard Group	Hazard Criterion	Personal Protective Equipment (PPE)		Classification	Medical Biomonitoring* **NOTE: These are the least expensive/most accessible options.**	Frequency and Duration	References
		biomagnification & bioaccumulation **GHS09 WARNING**  H410, H411 H412, 4413 Environment	6. Particulate filters for respirators 7. Apron		EN 467: 1995		test is needed once a year 2. All workers active in the spraying programme need to be tested once they leave the spray programme or are no longer active in the spraying programme	(https://dx.doi.org/10.1016/j.aca.2015.05.032) Esteban & Castano, 2009 (https://doi.org/10.1016/j.envint.2008.09.003) Ungerer, Ewers & Wilhelm, 2007 (https://doi.org/10.1016/j.ijheh.2007.01.024)
Glycines (Glyphosate)	3	Carcinogenicity **GHS07 WARNING** 	1.Neoprene gloves / chemically resistant nitrile gloves		EN 374:2016	**Whole blood tests** 1cc blood anti-coagulated in sodium	1.Before the beginning of the spraying for all groups a blood sample needs to be taken :	CDC National Biomonitoring Programme (https://www.cdc.gov/biomonitoring/biomo

Sub-set of Chemicals in Hazard Group	Hazard Group	Hazard Criterion	Personal Protective Equipment (PPE)	Classification	Medical Biomonitoring* **NOTE: These are the least expensive/most accessible options.**	Frequency and Duration	References
		H335, H336 **GHS08 DANGER**  H334, H350 H350i, H350I	2. Type 3 & Type 4 protective clothing  3. Safety boots 4. Face & eye protection 5. FPP3 masks 6. Apron 	EN 14605: 2005 EN 345:1993 EN 166:2001 EN 140 EN 149 EN 149:2001 EN 467: 1995	hepalin (refrigerated). Analyse with Comet Assay Or use field-based test kit	a. If the worker sprays less than 40 hours per month – additional testing not necessary b. If the worker sprays between 40 and 115 hours per month (1h/d) – additional testing not necessary c. If the worker sprays between 115 and 575 hours per month (5h/d) then additional testing not necessary d. If the worker sprays between 575 and 920 hours per month (8h/d) then additional testing is required every year	nitoring_summaries_3.html)

Sub-set of Chemicals in Hazard Group	Hazard Group	Hazard Criterion	Personal Protective Equipment (PPE)	Classification	Medical Biomonitoring* **NOTE: These are the least expensive/most accessible options.**	Frequency and Duration	References
						2. All workers active in the spraying programme need test once they leave the spray programme or are no longer active in the spray programme	
Dioxins	9	Dioxins (residues/ emissions) **GHSO6 DANGER**  H300, H301, H310, H311 H330, H331 **GHS08 DANGER**	1. Butyl rubber gloves 2. Type 3 & Type 4 protective clothing   Type 5 protective clothing 	EN 374:2016 EN 14605: 2005 BS EN ISO 13982: 2004	**Hair tests** 50-200g cleaned, dried and frozen. Tests done once off. **Whole blood tests** 1cc anti-coagulated in sodium hepalin	**Hair tests for Dioxins:** 1. Hair sample to be taken before spraying commences- before the worker is active in the spray programme 2. Hair sample to be taken when the worker leaves or is no longer active in the spray programme	Esteban & Castano, 2009 (https://doi.org/10.1016/j.envint.2008.09.003) Ungerer, Ewers & Wilhelm, 2007 (https://doi.org/10.1016/j.ijheh.2007.01.024)

Sub-set of Chemicals in Hazard Group	Hazard Group	Hazard Criterion	Personal Protective Equipment (PPE)		Classification	Medical Biomonitoring* **NOTE: These are the least expensive/most accessible options.**	Frequency and Duration	References
		 H304, H334, H370, H371 H372, H373 **GHS09 WARNING**  H400, H410, H411, H412, H413 Environment	3. Safety boots 4. Full face respirators for gases and vapours 5. Particulate filters for respirators 6. Apron		EN 345:1993 EN ISO 20345 EN 136 EN 141:2000 P95, P99, P100 EN 467: 1995	(refrigerated) . Analysed by Comet assay.	**Blood tests for Dioxins:** 1. Before the beginning of the spraying for all groups a blood sample needs to be taken : a. If the worker sprays less than 40 hours per month – additional testing not necessary b. If the worker sprays between 40 and 115 hours per month (1h/d) – additional testing not necessary c. If the worker sprays between 115 and 575 hours per month	CDC National Biomonitoring Programme (https://www.cdc.gov/biomonitoring/biomonitoring_summaries_3.html)

Sub-set of Chemicals in Hazard Group	Hazard Group	Hazard Criterion	Personal Protective Equipment (PPE)		Classification	Medical Biomonitoring* **NOTE: These are the least expensive/most accessible options.**	Frequency and Duration	References
							(5h/d) then additional testing is required once per year d. If the worker sprays between 575 and 920 hours per month (8h/d) then additional testing is required every 3-6 months 2. All workers active in the spraying programme need test once they leave the spray programme or are no longer active in the spray programme	
Heavy metals	10	Heavy Metals **GHSO6 DANGER**	1. Butyl rubber gloves 2. Type 3 & Type 4		EN 374:2016 EN 14605: 2005	**Hair tests** 50-200g cleaned, dried and frozen. Tests	**Hair tests for Heavy metals:** 1.Hair sample to be taken before spraying	Esteban & Castano, 2009 (https://doi.org/10.1016/j.envint.2008.09.003)

Sub-set of Chemicals in Hazard Group	Hazard Group	Hazard Criterion	Personal Protective Equipment (PPE)		Classification	Medical Biomonitoring* **NOTE: These are the least expensive/most accessible options.**	Frequency and Duration	References
		 H300, H310, H330, H331 **GHS08 DANGER**  H304, H334, H340, H341, H350, H351, H360, H361, H362, H370 H370, H371, H372 **GHS09 WARNING** 	protective clothing  Type 5 protective clothing  3. Safety boots 4. Full face respirators for gases and vapours 5. Particulate filters for respirators		BS EN ISO 13982: 2004 EN 345:1993 EN ISO 20345 EN 136 EN 141:2000 P95, P99, P100 EN 467: 1995	done once off. **Urine tests** 5cc fresh urine sample refrigerated. Regularly taken. Tested using ELISA test. 60cc needed for testing in children. (dip stick) Regularly taken.	commences- before the worker is active in the spray programme 2.Hair sample to be taken when the worker leaves or is no longer active in the spray programme **Blood tests for heavy metals:** 1. Before the beginning of the spraying for all groups a blood sample needs to be taken : a. If the worker sprays less than 40 hours per month – additional testing not necessary	CDC National Biomonitoring Programme (https://www.cdc.gov/biomonitoring/biomonitoring_summaries_3.html)

Sub-set of Chemicals in Hazard Group	Hazard Group	Hazard Criterion	Personal Protective Equipment (PPE)		Classification	Medical Biomonitoring* **NOTE: These are the least expensive/most accessible options.**	Frequency and Duration	References
		H400, H410, H411, H412, H413 Environment	6.Apron				b. If the worker sprays between 40 and 115 hours per month (1h/d) – additional testing not necessary c. If the worker sprays between 115 and 575 hours per month (5h/d) then additional testing is required once per year d. If the worker sprays between 575 and 920 hours per month (8h/d) then additional testing is required every 3-6 months 2. All workers active in the spraying programme need test	

Sub-set of Chemicals in Hazard Group	Hazard Group	Hazard Criterion	Personal Protective Equipment (PPE)		Classification	Medical Biomonitoring* NOTE: These are the least expensive/most accessible options.	Frequency and Duration	References
							once they leave the spray programme or are no longer active in the spray programme	

Ecological monitoring methods for the assessment of pesticides impacts in the tropics. handbook (Grant and Tingle, DFID, CTA, NRI, 2002). Chapters 5-13.

EU commission regulation number 546/2011: Implementing regulation EC No 1107/2009 of the European Parliament and of the Council as regards uniform principles of evaluation and authorization of plant protection products. 2011.

POPS – Heptachlor, Aldrin, Dieldrin, DDT, Endrin, Chlordane, Toxaphene, Hexachlorobenzene, Mirex.

PICS – 2,4,5-T, Aldrin, Benomyl, Binapacryl, Captafol, Carbofuran, Chlrodane, Chlorobenzilate, DDT, Dieldrin, Dinoseb, DNOC, DNOC ammonium salt, DNOC potassium salt, DNOC sodium salt, Ethylene dibromide, Ethylene dichloride, Ethylene oxide, Fluoroacetamide, Heptachlor, Hexachlorobenzene, Hexachlorocyclohexane, Lindane, Mercury, Methamidaphos, Monocrotophos, Paraquat dichloride, Parathion-methyl, PCP, Phophamidon, Thiram, Toxaphene, Z-Phosphamidon

1. Dimethylphosphate (DMP), Diethylphosphate (DEP), O,O-dimethylphosphorothiate (DMPT), O,O-diethylphosphorothiate (DEPT), O,O-dimethylphosphorodithioate (DMPDT) and O,O-diethylphosphorodithioate (DEPDT).

Environmental monitoring: https://www.who.int/water_sanitation_health/resourcesquality/wqmchap11.pdf?ua=1