Assessment of regulatory needs

Authority: European Chemicals Agency (ECHA)

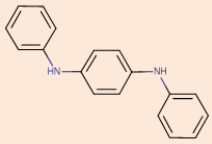
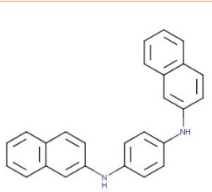
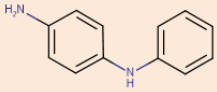
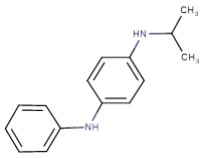
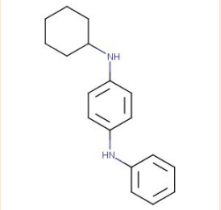
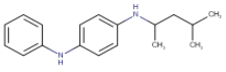
Group Name: Amino-substituted diarylamines

General structure: -

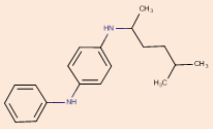
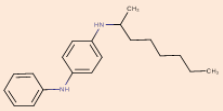
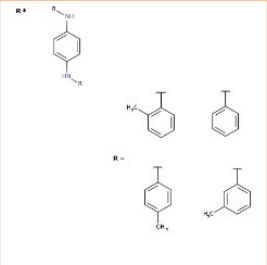
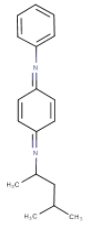
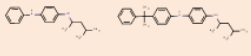
Revision history

Version	*Date*	*Description*
1.0	8 December 2023	

Substances within this group:

EC / List no (*)	CAS no	Substance name [and / or] Substance name acronyms	Chemical structures	Registration type (full, OSII or TII, NONS, cease manufacture), highest tonnage band among all the registrations (t / y) [1]
200-806-4	74-31-7	N,N'-diphenyl-p-phenylenediamine (DPPD)		Full, 10-100
202-249-2	93-46-9	N,N'-di-2-naphthyl-p-phenylenediamine		Not registered
202-951-9	101-54-2	N-(4-aminophenyl)aniline		Full, 1-10
202-969-7 (IPPD)	101-72-4	N-isopropyl-N'-phenyl-p-phenylenediamine (IPPD)		Full, 1000-10000
202-984-9	101-87-1	N-cyclohexyl-N'-phenyl-p-phenylenediamine		Not registered
212-344-0 (6PPD)	793-24-8	N-1,3-dimethylbutyl-N'-phenyl-p-phenylenediamine (6PPD)		Full, >1000

[1] n/a: not publicly available

221-374-3 (7PPD)	3081-01-4	N-(1,4-dimethylpentyl)-N'-phenylbenzene-1,4-diamine (7PPD)		Full, 10-100
239-102-7	15017-02-4	N,N'-bis(2-methylphenyl)benzene-1,4-diamine		Not registered
239-281-1 (8PPD)	15233-47-3	N-1-methylheptyl-N'-phenyl-p-phenylenediamine (8PPD)		C&L notification Not registered
260-173-5	56426-15-4	N-(4-aminophenyl)aniline hydrochloride		Not registered
270-820-3	68478-45-5	1,4 Benzenediamine, N,N'-mixed tolyl and xylyl derivs. (BENTAX)		Not registered
273-226-2	68953-83-3	1,4-Benzenediamine, N,N'-mixed Ph and tolyl and xylyl derivs. (BENPATAX)		Not registered
273-227-8	68953-84-4	1,4-Benzenediamine, N,N'-mixed Ph and tolyl derivs. (BENPAT)		Full, >1000
429-640-2	52870-46-9	N-(1,3-dimethylbutyl)-N'-(phenyl)-1,4-benzoquinonediimine (6QDI)		NONS, not (publicly) available
448-020-2	-	mixture of two components: 1. N-(1,3-dimethylbutyl)-N´-phenyl-p-phenylenediamine (6PPD) 2. N1-(1,3-dimethylbutyl)- N4-(4-(1-methyl-1-phenylethyl)phenyl)benzene-1,4-diamine (p-cumyl-6PPD)		Registered; cease manufacture
451-410-5	-	No public name available	Not publicly available	Claimed NONS
610-905-8	52870-46-9	Benzenamine, N-[4-[(1,3-		Not registered

		dimethylbutyl)imino]-2,5-cyclohexadien-1-ylidene]-		

(*) When a dossier is submitted without EC/List no, REACH-IT automatically assigns a List no to the dossier. Sometimes, due to IT technical limitations, duplicate List no's are created. In this group the following are considered duplicate entries: EC/List no 610-905-8 and EC/List 429-640-2. In general, EC no's take precedence over List no's.

This table contains also group members that are not registered (yet) but have a C&L notification under the CLP Regulation. However, the list is currently non-exhaustive. Once further regulatory risk management action on one or more registered substances is being considered, ECHA will make an additional search for related C&L notified substances to be included in the group and develop a regulatory strategy for them.

Contents

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The author does not accept any liability with regard to the use that may be made of the information contained in this document. Usage of the information remains under the sole responsibility of the user. Statements made or information contained in the document are without prejudice to any further regulatory work that ECHA, the Member States or other regulatory agencies may initiate at a later stage. Assessment of regulatory needs and their conclusions are compiled on the basis of available information and may change in light of newly available information or further assessment.

Foreword

The assessment of regulatory needs of a group of substances is an iterative, informal process to help authorities consider the most appropriate way to address an identified concern for a group of substances or a single substance and decide whether further regulatory risk management activities are necessary.

The grouping is mainly based on structural similarity and associations made by the registrants between substances through read-across and category approaches as well as category associations from external sources (e.g. OECD categories)[2]. These methods are different from grouping as defined in Section 1.5 of Annex XI to REACH because the scope and intended use of ECHA's grouping is different. Thus, in this context, grouping does not aim to validate read-across and category approaches according to the Annex XI requirements but rather to support a faster and more consistent approach for regulating chemicals and avoid regrettable substitution.

The focus of the assessment is largely based on information available in the registration dossiers and on properties requiring regulatory risk management action at EU level[3]. The information reported on uses is from the registration dossiers (IUCLID) and is used as a proxy for assessing how widespread uses are and whether potential for exposure to humans and releases to the environment can be expected. The chemical safety reports are not necessarily consulted and no quantitative exposure assessment is performed at this stage.

The outcome of these assessments are proposals for immediate (the first action) and subsequent regulatory action(s), including the foreseen ultimate regulatory action (last foreseen regulatory action) to address the identified concern(s) in case the potential hazards are confirmed. For example, further data generation through compliance check is suggested as a first action, to confirm the identified hazard.

Where hazards are confirmed, regulatory risk management actions could be considered for the whole group, for a subgroup or for individual substances within the group. The robustness of the group depends on the stage of assessment and the level of certainty this stage requires. For example, the needs for grouping under restriction may differ from the needs for grouping for the purpose of harmonised classification. Group membership is reconsidered accordingly throughout the iterative assessment of regulatory needs, for example, after further information is generated and the hazard has been clarified or when new insights on uses and risks are available.

The assessment of regulatory needs in itself does not represent a regulatory action, but rather a preparatory step to consider further possible regulatory actions at the level of individual substances or groups/subgroups of substances.

Publication of ARNs makes it easier for companies to follow the latest status of their substances of interest, anticipate potential regulatory actions and make strategic choices in their chemicals portfolio.

[2] Working with Groups - ECHA (europa.eu)

[3] Regarding hazard properties the focus is for instance on CMR (carcinogenic, mutagenic and/or toxic to reproduction), sensitiser, ED (endocrine disruptor), PBT/vPvB or equivalent (e.g. substances being persistent, mobile and toxic), aquatic toxicity hazard endpoints and therefore only those are reflected in the report. This does not mean that the substances do not have other known or potential hazards. In some specific cases, ECHA may consider additional hazards (e.g. neurotoxicity, STOT RE).

For more information on assessments of regulatory needs please consult ECHA's website[4].

[4] https://echa.europa.eu/understanding-assessment-regulatory-needs

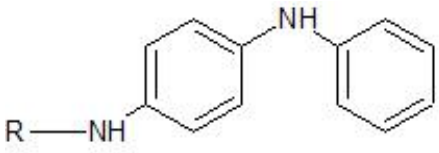
Glossary

ARN	Assessment of Regulatory Needs
CCH	Compliance Check
CLH	Harmonised classification and labelling
CMR	Carcinogenic, mutagenic and/or toxic to reproduction
Dev	Dossier evaluation
ED	Endocrine disruptor
NONS	Notified new substances
OEL	Occupational exposure limit
OSII or TII	On-site isolated intermediate or transported isolated intermediate
PBT/vPvB	Persistent, bioaccumulative and toxic/very persistent and very bioaccumulative
PMT/vPvM	Persistent, mobile, and toxic / very persistent and very mobile
RDT	Repeated dose toxicity
RMOA	Regulatory management options analysis
RRM	Regulatory risk management
SEv	Substance evaluation
STOT RE	Specific target organ toxicity, repeated exposure
SVHC	Substance of very high concern
TPE	Testing proposal evaluation

1 Overview of the group

Explanations on the scope of this assessment is available in the foreword to this document. Please read it carefully before going through the report.

ECHA has grouped structurally similar substances based on the presence of the amino diarylamine moiety shown in the figure below.



R=H or alkyl or phenyl or alkylphenyl

The group members differ from each other by the substitution of the primary amine group (i.e. *para*-aminodiphenylamine). The substituent can be an alkyl (branched C3, C6, C7 or C8), a phenyl or an alkylphenyl group. In addition, the group includes N,N'-di-2-naphthyl-p-phenylenediamine, and 1,4-Benzenediamine, N,N'-mixed Ph and tolyl derivatives with methyl or hydroxyl groups on the aromatic rings in the orto position.

The amino substituted diarylamines group consists of 17 substances, 6 of which have full registrations.

Based on the information reported in the REACH registration dossiers, the substances are mostly used as antioxidant/stabiliser in polymers (tyres, rubber goods and unspecified polymers), and to a lesser extent, in fuels and in adhesives and sealants, with professional uses, consumer uses and articles service life. One substance (EC 202-951-9) has a different use profile as it is used as intermediate (main tonnage) and, to a lesser extent, as lubricant in vehicles and machinery (lubricant, metal working fluid, heat transfer fluid, hydraulic fluid). The other substances of the group have inactive registration (EC 448-020-2), or are NONS or not registered (EC/list 451-410-5, 429-640-2/610-905-8, 239-281-1 (8PPD), 202-984-9, 260-173-5, 202-249-2, 273-226-2, 270-820-3 (BENPATAX), 239-102-7). Thus, no information is available on their uses.

Five substances have a self-classification for reproductive toxicity (Repr. 1B: EC/List 212-344-0 (6PPD), 221-374-3 (7PPD), 448-020-2; Repr. 2: EC 200-806-4 (DPPD)), or a Repr. 1B (H360FD) CLH proposal from RAC[5] (EC 273-227-8 (BENPAT)). EC 221-374-3 (7PPD) is under substance evaluation for P/vP concern, EC 273-227-8 (BENPAT) for PBT concern. For EC 448-020-2 (ceased manufacture) SEv[6] could not conclude on environmental properties/ PBT concern (more data would be needed). However, as this substance no longer has any active registration, the evaluation was terminated. Data generation (i.e. one pre-natal and two extended one-generation studies) is furthermore ongoing for 2 members of the group (EC 200-806-4 (DPPD) DL 2023, 202-969-7 (IPPD) DL 2023).

[5] https://echa.europa.eu/registry-of-clh-intentions-until-outcome/-/dislist/details/0b0236e183955610

[6] https://echa.europa.eu/documents/10162/df082082-5491-93da-5df1-4373b9a9bc0f

2 Conclusions and actions

The conclusions and actions proposed in the table below are based mainly on the REACH and CLP information available at the time of the assessment by ECHA. The conclusions are preliminary suggestions from a screening-level assessment done by ECHA with the aim to propose the next steps for further work (e.g., strengthening of the hazard conclusions, clarification of the uses and/or potential for exposure). The main source of information is the registration dossiers. Relevant public assessments may also be considered. When new information (e.g., on hazards through evaluation processes, or on uses) will become available, the document may be updated, and conclusions and actions revisited.

Table: Conclusions and proposed actions

Subgroup name, EC/List no, substance name	Human Health Hazard	Environmental Hazard	Relevant use(s) & exposure potential	Suggested regulatory actions
EC 212-344-0 (6PPD) EC 202-969-7 (IPPD) EC 273-227-8 (BENPAT)	Known or potential hazard for reproductive toxicity, for carcinogenicity (EC 212-344-0 (6PPD)), for mutagenicity (EC 212-344-0 (6PPD)), skin sensitisation, STOT RE	Known or potential hazard for aquatic toxicity (all), and PBT/vPvB (EC 212-344-0) Inconclusive hazard for PBT/vPvB (EC 202-969-7 (IPPD), EC 273-277-8) Inconclusive hazard for PMT/vPvM (EC 212-344-0, EC 202-969-7 (IPPD)) No hazard or unlikely hazard for PMT/vPvB (EC 273-227-8 (BENPAT))	Widespread use and high tonnage in tyres and rubber goods. High potential for releases	**First step:** ongoing CCH **Potential next steps (if hazard confirmed):** CLH (Repr. – all substances; aquatic toxicity for EC 273-227-8 (BENPAT)) Restriction **Potential last action: Restriction** Justification: - Restriction of 6PPD in tyres due to high aquatic toxicity (including degradation products) and release potential from tyres To be extended to EC 202-969-7 (IPPD) if aquatic toxicity is confirmed and to EC 273-227-8 (BENPAT) - Restriction of use in rubber goods and polymers: restriction

Subgroup name, EC/List no, substance name	Human Health Hazard	Environmental Hazard	Relevant use(s) & exposure potential	Suggested regulatory actions
				under art. 68(2) on the basis of CMR properties (Repr. 1B) and use of articles by consumer
EC 200-806-4 (DPPD) EC 221-374-3 (7PPD)	Known or potential hazard for reproductive toxicity for skin sensitisation, for mutagenicity (EC 200-806-4 (DPPD)), and STOT RE	Known or potential hazard for aquatic toxicity (all), for PBT/vPvB (EC 200-806-4 (DPPD)) Inconclusive hazard for PBT/vPvB (EC 221-374-3 (7PPD)) Inconclusive hazard for PMT/vPvM	Use in tyres and rubber goods and Adhesive/fuels (EC 221-374-3 (7PPD)) Use in polymers (EC 200-806-4 (DPPD))	**First step:** CCH (EC 200-806-4 (DPPD)) Ongoing SEv (EC 221-374-3 (7PPD)) **Potential next steps (if hazard confirmed):** CLH (Repr. – all substance; mutagenicity for EC 200-806-4 (DPPD), aquatic toxicity for EC 200-806-4 (DPPD) SVHC identification (PBT) restriction **Potential last action: Restriction** Justification: - Restriction (ban of all uses) due to PBT properties if PBT is confirmed - Restriction of use in rubber goods and polymers: restriction under art. 68(2) on the basis of CMR properties (Repr. 1B) and use of articles by consumer - Restriction under entry 30 of Annex XVII triggered by CLH

Subgroup name, EC/List no, substance name	Human Health Hazard	Environmental Hazard	Relevant use(s) & exposure potential	Suggested regulatory actions
				- Repro 1B for EC 221-374-3 (7PPD) used in adhesives
EC 202-951-9	Known or potential hazard for reproductive toxicity, for carcinogenicity, for mutagenicity, skin sensitisation, and STOT RE	Known or potential hazard for aquatic toxicity Inconclusive hazard for PBT/vPvB for PMT/vPvM	Use in lubricants	**First step:** CLH (aquatic toxicity) **Potential next steps (if hazard confirmed):** CLH (Repr.) restriction **Potential last action: Restriction** Justification: - Restriction under entry 30 of Annex XVII triggered by CLH Repro 1B for use in lubricants
EC 448-020-2 EC 451-410-5 EC 429-640-2 (610-905-8) EC 239-281-1 (8PPD) EC 202-984-9 EC 260-173-5 EC 202-249-2 EC 270-820-3 (BENPATAX) EC 273-226-2 EC 239-102-7	Known or potential hazard for reproductive toxicity, for carcinogenicity (429-640-2), skin sensitisation, and STOT RE	Known or potential hazard for aquatic toxicity, for PBT/vPvB No hazard or unlikely hazard for PMT/vPvB (EC 448-020-2, EC 451-410-5)	Not registered (EC 239-281-1 (8PPD), 202-984-9, 260-173-5, 202-249-2) Inactive registration (EC 448-020-2) Not updated NONS (EC 451-410-5, 429-640-2, 610-905-8)	**Currently no need for EU RRM** Justification: If these substances will be registered in the future, they should be addressed under the proposed actions above

3 Justification for the need for regulatory risk management action at EU level

Suggested regulatory risk management action for all registered substances in the group (ECs 200-806-4 (DPPD), 202-951-9, 202-969-7 (IPPD), 212-344-0 (6PPD), 221-374-3 (7PPD), 273-227-8 (BENPAT)) if reproductive toxicity and PBT and/or aquatic toxicity hazards are confirmed

Based on ECHA's assessment of currently available hazard information, it is considered that all substances in the group have potentially the following human health hazards: **reproductive and developmental toxicity and skin sensitisation**.

Reproductive and developmental toxicity properties are based on consistently observed toxic effects for about half of the group members. Three group members (ECs 448-020-2, 212-344-0 (6PPD), 221-374-3 (7PPD)) are already self-classified by the Registrants as Repr. 1B, one (EC 273-227-8 (BENPAT)) was under CLH and RAC adopted in its opinion the proposal for classification as Repr. 1B [7], and one (EC 200-806-4 (DPPD)) is currently self-classified as Repr. 2 (considered potential Repr. 1B, data generation ongoing). For EC 212-344-0 (6PPD), there is a CLH proposal by Austria for Repr. 1B[8]. Effects on sexual function and fertility were observed for all five substances. In one case, an indication of testicular toxicity was observed at high testing doses (EC 202-951-9). Notably, this substance is not substituted on the primary amino group. Developmental toxicity is based on observed effects from several studies conducted on the registered substances, including pre-natal and extended one-generation reproductive toxicity studies. The reported developmental effects were observed mainly in the presence of maternal toxicity effects. The reprotoxic effects of BENPAT included dystocia and impaired oestrous cycling, as well as developmental effects with polycystic kidneys were observed in the offspring in the absence of maternal toxicity. The ongoing data generation will be instrumental to confirm and better quantify the reproduction and developmental toxicity for all substances. Based on structural similarity, the potential toxicity findings are extrapolated to those substances for which there is limited information for this endpoint.

In addition, the vast majority of the substances have known skin sensitisation properties based on *in vivo* and *in vitro* studies. The following substances contain impurities or constituents with skin sensitisation properties above 0.1 % (ECs 202-951-9, 212-344-0 (6PPD), 221-374-3 (7PPD), 448-020-2, 273-227-8 (BENPAT)) and are self-classified.

For mutagenicity, for one substance (EC 200-806-4 (DPPD)) *in vivo* studies are ongoing to clarify positive *in vitro* findings (DL 2023). The substance is self-classified currently as Muta 2. For the remaining group members, positive *in vitro* findings have not been confirmed by *in vivo* studies. However, there is some remaining uncertainty due to the reporting and considerations of the quality of the available information that will be reassessed once the ongoing *in vivo* study for EC 200-806-4 (DPPD) is available. The strategy will then be revisited accordingly, if needed. The following substances contain impurities (EC 200-539-3 up to 0.2%; CAS 108-10-1 up to 0.5%) with carcinogenic properties (ECs 202-951-9, 212-344-0 (6PPD), 429-640-2) and are not self-classified.

[7] https://echa.europa.eu/registry-of-clh-intentions-until-outcome/-/dislist/details/0b0236e183955610

[8] https://echa.europa.eu/registry-of-clh-intentions-until-outcome/-/dislist/details/0b0236e186eecc7b

Based on the available information there is currently no relevant indication for carcinogenicity or ED potential for this group of substances. However, dystocia seen with EC 212-344-0 (6PPD) gives some potential concern for ED mediated mode of action.

Based on ECHA's assessment of currently available hazard information, it is considered that all substances in the group have (potentially) the following environmental hazards: **general toxicity to aquatic organisms** (most of them being self-classified for acute and chronic aquatic toxicity category 1).

Additionally, based on ECHA's assessment of currently available hazard information, EC 200-806-4 (DPPD) fulfils the **PBT/vPvB** screening criteria, whereas the assessment for EC 221-374-3 (7PPD) is inconclusive:

• these substances are potentially persistent or very persistent (P/vP) as EC 200-806-4 (DPPD) is not readily biodegradable and its calculated degradation half-life for hydrolysis in marine, fresh- or estuarine water is higher than 60 days; for EC 221-374-3 (7PPD) degradation half-life in soil (anaerobic conditions) is higher than 180 days;

• EC 200-806-4 (DPPD) is potentially bioaccumulative or very bioaccumulative (B/vB) as it meets the B criteria as set out in Annex XIII (measured BCF ranging from 260 to 2150); EC 221-374-3 (7PPD) is an ionisable substance and high potential for bioaccumulation cannot be excluded solely based on its potential to partition to lipid, as other partitioning mechanisms may drive bioaccumulation (e.g. binding to protein/cell membranes), therefore the B assessment is inconclusive;

• both substances are self-classified as Repr. 1B. Moreover, fulfilment of T criteria set in Annex XIII for EC 200-806-4 (DPPD) cannot be excluded due to uncertainties in available studies; EC 221-374-3 (7PPD) meets the T criteria set in Annex XIII: NOEC < 0.01 mg/L or classification (read across with EC 212-344-0 (6PPD)).

Considering the available data and the proposed read-across, the PBT potential can be assumed also for a third substance (EC 212-344-0 (6PPD)) based on structural similarity and available read-across justification.

PBT/vPvB potential for EC 202-951-9 and EC 202-969-7 (IPPD) is inconclusive. Considering the structural similarity with the other alkyl amino substituted diarylamines (EC 221-374-3 (7PPD) and EC 212-344-0 (6PPD)), a similar degradation behaviour (and therefore vP potential) is expected. No conclusion on bioaccumulation potential can be made considering that pKa values are in the range of environmentally relevant pH and therefore $LogK_{ow}$ can not be used to adequately predict bioaccumulation behaviour and no BCF data are available. Moreover, these two substances are potentially T due to uncertainties related to aquatic toxicity values. However, considering that indications of potential hazards are related to other substances in the group for which there are ongoing actions that need to finish to confirm those hazards, no action is proposed for the moment.

For EC 273-227-8 (BENPAT) a substance evaluation conclusion is available[9]. BENPAT is a multi-constituent substance with three main constituents (R-59, R1679 and R-898). All three constituents are considered to fulfil the P/vP screening criterion based on ready biodegradability tests. However, the constituents are susceptible to oxidation and results from a simulation study do not yield unambiguous results on degradation. In summary, a definitive conclusion on persistence is not possible. All three constituents show BCF values > 2000 in fish and are therefore considered to fulfil the B criterion. Its constituent R-898 has a BMF of 0.174 and a fish BCF of > 5000. The constituent R-898 is therefore considered to fulfil the vB criterion as well. A NOEC < 0.01 mg/L was observed in a study on long-term toxicity of BENPAT to daphnids. Based on the high structural

[9] https://echa.europa.eu/information-on-chemicals/evaluation/community-rolling-action-plan/corap-table/-/dislist/details/0b0236e1807e5121

similarity between the constituents and their predicted common mode of action, both BENPAT as a whole substance and its single constituents (including R-898) are considered to fulfil the T criterion. Based on the uncertainty regarding the P-criterion, the PBT assessment is inconclusive.

Repr. 1B is based on currently available information for three Repr. 1B self-classified substances. For the currently self-classified Repr. 2 substance (EC 200-806-4 (DPPD)), ongoing data generation is expected to lead to Repr. 1B. **CLH for Reproductive toxicity for all registered substances** is proposed as a first step towards restriction. CLH for Repr. 1B will trigger **restriction under entry 30 of Annex XVII** for consumer uses in mixtures (e.g. EC 221-374-3 (7PPD) in adhesives, EC 202-951-9 in lubricants). This will at the same time protect consumers against skin sensitising properties. Some of the substances are reported to be used in rubber goods and polymers as stabilisers and more specifically as antioxidants. There is release potential of antioxidants used in polymers, due to the fact that they deliver their function especially at the interface between the polymer surface and air with consequent likelihood of exposure by consumers. Moreover, the tendency of migration of additives from rubber matrices (mostly mentioned in the use description) is in general more pronounced than in other polymer matrices, like plastic materials. Therefore, we propose a **restriction for use in rubber and polymers articles used by consumers under article 68(2)** on the basis of the abovementioned Repr. 1B (ECs 212-344-0 (6PPD), 202-969-7 (IPPD), 200-806-4 (DPPD), 221-374-3 (7PPD), 273-227-8 (BENPAT)).

Substances in the group are also highly toxic for the aquatic environment, in particular substance EC 212-344-0 (6PPD). 6PPD is widely used at high tonnage band as antioxidant in tyres, and there is some evidence of an uncontrolled risk for aquatic ecosystem correlated to highly toxic transformation products generated during releases to surface water of tyre particles (from tyres abrasion during their service life) (Tian *et al*., 2020[10]; Johannessen *et al*., 2021, Tian *et al*., 2022, Brinkmann *et al.*, 2022). Therefore, a **restriction for use in tyres to prevent an EU-wide environmental risk** is proposed. The proposed restriction on microplastics and the investigation on a restriction on substances in infill[11] material (including from recycled tyres) do not cover releases from tyres during use. 6PPD might also have PBT properties (see discussion below) based on structural similarity with 7PPD. However, due to the highly toxic effects on aquatic organisms, the exposure potential and the uncertainty of the process to clarify PBT properties of the substance, it is proposed to not wait, and to proceed with restriction based on environmental risk. The restriction will be also extended to the substance ECs 202-

[10] Main outcomes in the scientific article: In U.S. Pacific Northwest coho salmon, stormwater exposure annually causes unexplained acute mortality when adult salmon migrate to urban creeks to reproduce. Widespread occurrence of 6PPD-quinone (<0.3-19 µg/L) at toxic concentrations (LC_{50} of 0.8 ± 0.16 µg/L) has been found in roadway runoff and stormwater-impacted creeks of the U.S. West Coast. Quinone transformation product of 6PPD is typically formed in combination with ozone (particularly abundant during storm events) and is likely implicated in the mortality events to aquatic species.

[11] Information on the restriction on intentionally added microplastics available at: https://echa.europa.eu/registry-of-restriction-intentions/-/dislist/details/0b0236e18244cd73. The opinions from RAC and SEAC have been sent to the Commission but the Commission has not made a decision yet. Investigation report on substances in infill material available at:

https://echa.europa.eu/documents/10162/17220/rest_sub_infill_material_investigation_report_en.pdf/77424e81-d78e-8abc-1404-f213d27c2b3f?t=1620812618319. 6PPD was one of the substances of interest for prioritisation; it was however just below the cut-off scoring due to low sample frequency although high concentrations were reported. ECHA concluded in its report that further work is recommended to be done on substance in infill material within the context of an Annex XV restriction proposal, and that this work should include an assessment of recently published studies that were not considered as part of this assessment (e.g., the publication of Tian *et al,* 2020, was not taken into account at that time).

969-7 (IPPD) and 273-227-8 (BENPAT), which have similar use patterns (use in tyres at relatively high tonnages). For EC 202-969-7 (IPPD), the high toxicity to environment should first be confirmed by ongoing CCH.

EC 200-806-4 (DPPD) currently has a harmonised classification as Aquatic Chronic 3, but this comes from the previous legislation transferred to CLP Regulation. According to the available data, a review of the existing classification would lead to Aquatic Acute 1 and Aquatic Chronic 1 classification. A revision of environmental classification according to CLP Regulation is therefore proposed for EC 200-806-4 (DPPD). For EC 202-951-9, CLH for aquatic toxicity is also proposed to ensure that mixtures containing this substance are adequately classified (via the M-factor) even at concentrations below those that trigger restriction under entry 30 of Annex XVII. EC 273-227-8 (BENPAT) has no harmonised classification; considering the toxicity to aquatic organisms, CLH is proposed for this substance as well.

Finally, among the registered substances, EC 200-806-4 (DPPD) screens as potentially **PBT**, whereas the PBT assessment for EC 221-374-3 (7PPD) is inconclusive. However, it remains to be clarified if these substances meet the PBT/vPvB criteria through a new CCH for EC 200-806-4 (DPPD) and ongoing SEv for EC 221-374-3 (7PPD). The outcome of CCH and SEV could support concluding on PBT properties for the entire group. They are also used in polymers (EC 200-806-4 (DPPD)) and tyres / rubber goods (EC 221-374-3 (7PPD)) with likely potential for releases (although at relatively lower tonnage bands). For EC 273-227-8 (BENPAT), a substance evaluation conclusion is available (see reference above). This substance is considered to fulfil both B and T criteria, whereas a definitive conclusion on persistency on the basis of the available information is considered not possible, therefore the PBT assessment for this substance is inconclusive. Should the hazard be confirmed, for ECs 200-806-4 (DPPD) and 221-374-3 (7PPD) we propose a **restriction based on PBT properties** in order to ensure that releases to the environment are minimised for all the uses. Although these substances are also toxic for aquatic organisms, we conclude that a restriction based on PBT properties (if confirmed) would be more effective in reducing the risk and more efficient resource-wise, than a restriction based on currently confirmed aquatic toxicity targeted to uses where exposure exceeds a threshold. The reasons for that proposal are that tonnages are rather low and there is an ongoing PBT assessment. The first step toward restriction would be the formal confirmation of the PBT properties through SVHC identification and inclusion in candidate list.

The only substance in the group with a reliable $LogK_{oc}$ value fulfilling the M criteria is EC 202-951-9. However, as reported above, the persistency of this substance is inconclusive, therefore the **PMT hazard** is inconclusive as well. For EC 448-020-2, EC 451-410-5 and the three constituents of EC 273-227-8 (BENPAT) $logK_{oc}$ values are above the M criterion. For the remaining substances, no reliable $logK_{oc}$ values are available, the mobility for these substances is therefore inconclusive.

The risk associated to **use by workers** is expected to be minimised by the already proposed restrictions (which will also affect upstream uses, like polymer production, by limiting the amount of the substance in the final article / product) and the CLH for Repr. 1B, which will trigger actions by workers while handling mixtures containing the substances under Directives 98/24/EC (chemical agents at work), 92/85/EEC (pregnant workers), 94/33/EC (young workers). Should mutagenicity be confirmed *in vivo* for substance (EC 200-806-4 (DPPD)), CLH should be initiated (Muta 1B). This would trigger action under Directive 2004/37/EC (carcinogens and mutagens at work). There is no need to put in place specific actions related to skin sensitising properties (all substances are correctly self-classified for this endpoint).

There is **no need to suggest (further) EU regulatory risk management** for not registered substances in the group, since they are not in use (one substance has ceased the production and registration is now inactive). Since these substances

potentially have similar hazard properties as the registered substances, based on structural similarity, their registration status will be monitored to address the potential concern in case it changes.

Annex 1: Overview of classifications

Data consulted on [25/11/2021]

EC/ List No	CAS No	Substance name	Harmonised classification	Classification in registrations
200-806-4 (DPPD)	74-31-7	N,N'-diphenyl-p-phenylenediamine (DPPD)	*Skin Sens. 1 H317* *Aquatic Chronic 3 H412*	*Aquatic Chronic 1 H410* *Aquatic Acute 1 H400* *Muta. 2 H341* *Repr. 2 H361, specific effect: fertility*
202-969-7 (IPPD)	101-72-4	N-isopropyl-N'-phenyl-p-phenylenediamine (IPPD)	*Aquatic Chronic 1 H410* *Acute Tox. 4 H302* *Skin Sens. 1 H317* *Aquatic Acute 1 H400*	*Acute Tox. 4 H302* *Skin Sens. 1 H317* *Aquatic Acute 1 H400* *Aquatic Chronic 1 H410*
202-951-9	101-54-2	N-(4-aminophenyl)aniline		*Acute Tox. 4 H302* *Eye Irrit. 2 H319* *Skin Sens. 1 H317* *Aquatic Chronic 1 H410*
212-344-0 (6PPD)	793-24-8	N-1,3-dimethylbutyl-N'-phenyl-p-phenylenediamine (6PPD)		***Repr. 1B*** *H360* *Acute Tox. 4 H302* *Skin Sens. 1 H317* *Aquatic Acute 1 H400, M-factor: 10.00* *Aquatic Chronic 1 H410, M-factor: 10.00*
221-374-3 (7PPD)	3081-01-4	N-(1,4-dimethylpentyl)-N'-phenylbenzene-1,4-diamine (7PPD)		***Repr. 1B*** *H360* *Skin Sens. 1 H317* *Aquatic Acute 1 H400, M-factor: 10.00* *Aquatic Chronic 1 H410, M-factor: 10.00*
273-227-8 (BENPAT)	68953-84-4	1,4-Benzenediamine, N,N'-mixed Ph and tolyl derivs.		*Skin Sens. 1B H317* ***Repr. 2*** *H361* *Aquatic Acute 1 H400* *Aquatic Chronic 1 H410*
429-640-2	52870-46-9	N-(1,3-dimethylbutyl)-N'-(phenyl)-1,4-benzoquinonediimine	*Aquatic Acute 1 H400* *Aquatic Chronic 1 H410* *Eye Irrit. 2 H31*	
448-020-2	-	448-020-2		*Aquatic Chronic 2 H411 [Article 10 (inactive)]* *STOT Rep. Exp. 1 H372, affected organs: liver [Article 10 (inactive)]* ***Repr. 1B*** *H360 [Article 10 (inactive)]* *Skin Sens. 1 H317 [Article 10 (inactive)]*

(*) the number in brackets indicates the number of notifications received. Each notification can represent a group of notifiers, therefore the number may differ from the C&L inventory which displays number of notifiers.

Annex 2: Overview of uses based on information available in registration dossiers

Data consulted on 10 November 2021 (all except EC 273-227-8 (BENPAT)) and 22 March 2022 (EC 273-227-8 (BENPAT)).

Main types of applications structured by product or article types		EC 221-374-3 (7PPD) 7PPD	EC 212-344-0 6PPD	EC 202-969-7 (IPPD)	EC 273-227-8 (BENPAT)	EC 200-806-4 (DPPD)	EC 202-951-9	EC 448-020-2
Use profile 1	PC 13: Fuels	F, I, **P, C**	F, I, **P, C**					
	PC 32: Polymer preparations and compounds	F, I, **P, A****	F, I, **P, C, A****	F, I, **P, C, A****	F, I, **P, C, A****	F, I, **A**	(as intermediate)	*I (inactive)*
	PC 1: Adhesives, sealants	F, I, **P, C, A***						
Use profile 2	PC 24: Lubricants, greases, release products						F, I, **P, C**	
	PC 25: Metal working fluids						F	
	PC 16: Heat transfer fluids						I, **P**	
	PC 17: Hydraulic fluids						F, I, **P**	
	PC 21: Laboratory chemicals						F	
Use profile 3	PC 19: Intermediate						I	

F: formulation, I: industrial use, P: professional use, C: consumer use, A: article service life; P, C and A are highlighted in red to indicate widespread use with potential for exposure/release

* ECHA assumes that A is relevant for adhesives and sealants, although not included in the registration
** Use in tyres and rubber goods

Annex 3: Overview of completed or ongoing regulatory risk management activities

For EC 212-344-0 (6PPD), there is a CLH proposal by Austria for Repr. 1B[12].

For EC 273-227-8 (BENPAT), a CLH proposal from RAC[13] as Repr. 1B (H360FD) is available.

For ECs / List 448-020-2[14] and 221-374-3 (7PPD) substance evaluations are available or ongoing.

There are no other relevant completed or ongoing regulatory risk management activities for any of the substances.

[12] https://echa.europa.eu/registry-of-clh-intentions-until-outcome/-/dislist/details/0b0236e186eecc7b

[13] https://echa.europa.eu/registry-of-clh-intentions-until-outcome/-/dislist/details/0b0236e183955610

[14] https://echa.europa.eu/documents/10162/df082082-5491-93da-5df1-4373b9a9bc0f