Assessment of regulatory needs

Authority: European Chemicals Agency (ECHA)

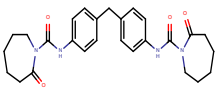
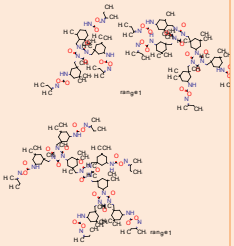
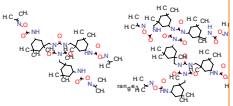
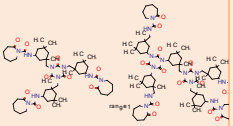
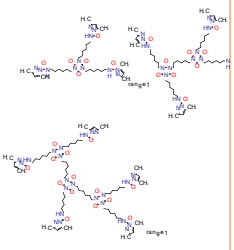
Group Name: Blocked Isocyanates

General structure:

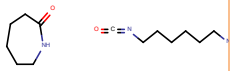
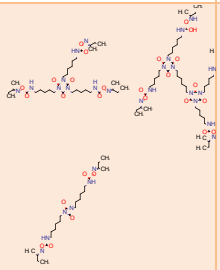
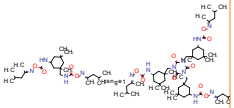
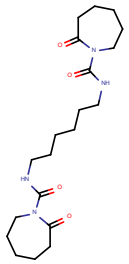
Revision history

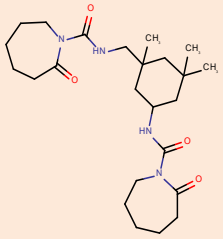
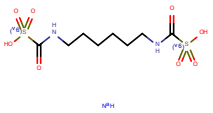
Version	*Date*	*Description*
1.0	19 December 2023	

Substances within this group:

EC / List number	CAS number	Substance name	Chemical structures	Registration type (full, OSII or TII, NONS), highest tonnage band among all the registrations (t/y) [1]
Subgroup 1A				
258-981-8	54112-23-1	N,N'-(methylenedi-p-phenylene)bis[hexahydro-2-oxo-1H-azepine-1-carboxamide]		Full, 100-1000
500-287-7	103170-26-9	3-Isocyanatomethyl-3,5,5-trimethylcyclohexyl isocyanate, oligomers, reaction products with 2-butanone oxime		Full, >1000
600-028-9	1001254-87-0			Full, not (publicly) available
603-188-8	127184-53-6			Full, not (publicly) available
605-318-9	163206-31-3			Full, >1000

[1] Note that the total aggregated tonnage band may be available on ECHA's webpage at https://echa.europa.eu/information-on-chemicals/registered-substances

EC/List number	CAS number	Substance name	Chemical structures	Registration type (full, OSII or TII, NONS), highest tonnage band among all the registrations (t/y) [1]
606-423-2	200295-52-9		Not available	Full, 10-100
607-997-7		2H-Azepin-2-one, hexahydro-, polymer with 1,6-diisocyanatohexane		Full, 100-1000
617-779-3	85940-94-9			Full, >1000
935-560-3		Reaction mass of 3-Isocyanatolmethyl-3,5,5-trimethylcyclohexyl isocyanate (Isophorone diisocyanate) with 4-Methylpentan-2-one oxime		OSII or TII
Subgroup 1B				
227-563-7	5888-87-9	N,N'-hexane-1,6-diylbis(hexahydro-2-oxo-1H-azepine-1-carboxamide)		Full, 100-1000

EC/List number	CAS number	Substance name	Chemical structures	Registration type (full, OSII or TII, NONS), highest tonnage band among all the registrations (t/y) [1]
259-920-8	55954-19-3	hexahydro-N-[3-[[[(hexahydro-2-oxo-1H-azepin-1-yl)carbonyl]amino]methyl]-3,5,5-trimethylcyclohexyl]-2-oxo-1H-azepine-1-carboxamide [IPDI monomer - CL]		C&L Notifications exists
438-980-0				Not Registered
Group 2				
690-526-2	38632-47-2	[HDI monomer - bisulfite]		Full, not (publicly) available

This table contains also group members that are only notified under the CLP Regulation. However, the list is not necessarily exhaustive.

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.

[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).

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.

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

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

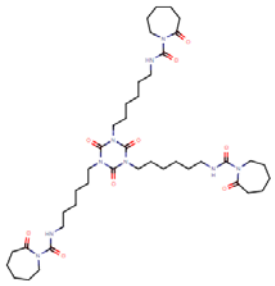
Glossary

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
PNDT	Prenatal Developmental Toxicity Study
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

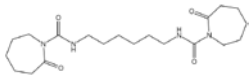
1 Overview of the group

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 together structurally similar substances based on the presence of a (di)isocyanate moiety (either mono- or oligomeric) reacted with an agent blocking the isocyanate function as shown in the figure below. The group consists of 13 substances.



List 607-997-7
(HDI oligomer blocked with caprolactam)



EC 227-563-7
(HDI monomer blocked with caprolactam)

Figure 1: Examples of blocked isocyanates with oligomeric and monomeric diisocyanate moiety

The substances of the assessed group have the following types of isocyanate moieties (either monomer or oligomer) and blocking agents. Since those substances may be released during curing, relevant information e.g. on their hazards (classifications) is presented in Annex 1.

Diisocyanate moieties:

- MDI: 4,4'-methylenediphenyl diisocyanate
- HDI: hexamethylene diisocyanate
- IPDI: isophorone diisocyanate

Blocking agents:

- Pyrazole: 3,5-dimethypyrazole (DMP)
- Oximes: butanone oxime (MEKO), acetone oxime, 4-methylpentan-2-one oxime (MIBKO)
- ε-Caprolactam (CL)
- Bisulfite

The blocked diisocyanates covered in this assessment have in principle similar uses as the diisocyanates MDI, HDI and IPDI in the production of polyurethane materials. Their primarily use is in coatings with a high degree of resistance to chemicals, abrasion and weather, but they are also used to make adhesives, sealants and for the production of polyurethane elastomers (see 'Assessment of Regulatory Needs', ARN, for Isocyanates). However, by blocking the reactive isocyanate function, the substances can e.g. easily be dispersed in water to produce waterborne resins.

For the purpose of this assessment, the substances were grouped. Grouping to group 1 and group 2 is based on uses, with group 1 substances having similar use profiles (polyurethane applications, in coatings, sealants and adhesives), whereas the single substance of group 2 has a different blocking agent and a different use (leather treatment product). Group 1 is further sub-grouped to distinguish

substances with PBT/vPvB properties (subgroup 1A) from substances with PMT properties (subgroup 1B).

Group 1: Substances with blocking agents such as pyrazole, oximes or caprolactam were grouped into group 1. A subgrouping was performed to distinguish between substances with PBT/vPvB properties, which are mainly oligomeric (except EC 258-981-8) (subgroup 1A) and substances with PMT properties, which are monomeric (subgroup 1B) isocyanate moieties.

Subgroup 1A: substances with potential PBT/vPvB properties

- EC 258-981-8 (MDI monomer - CL)
- List 500-287-7 (IPDI oligomer - MEKO)
- List 600-028-9 (IPDI oligomer – acetone oxime)
- List 603-188-8 (IPDI oligomer - CL
- List 605-318-9 (HDI oligomer – DMP)
- List 606-423-2 (IPDI oligomer - DMP
- List 607-997-7 (HDI oligomer - CL)
- List 617-779-3 (HDI oligomer - MEKO)
- List 935-560-3 (HDI oligomer - 4-methylpentan-2-one oxime); intermediate

Subgroup 1B: substances with potential PMT/vPvM properties

- EC 227-563-7 (HDI monomer - CL)
- EC 259-920-8 (IPDI monomer - CL); not registered
- EC 438-980-0 (*isocyanate monomer* - CL); registration revoked

Group 2: The only substance of this group (List 690-526-2) is a HDI monomer which is blocked with bisulfite. It was grouped separately due to relevant differences in the blocking agent and uses (leather treatment product).

The substances of subgroup 1A are fully registered, except List 935-560-3, which is an intermediate. In subgroup 1B one substance is fully registered (EC 227-563-7) one is not registered (EC 259-920-8) and for one (EC 438-980-0) the registration was revoked. The only substance of group 2 is fully registered.

Article service life applications are reported for one caprolactam blocked isocyanate for polymer preparations and for one MEKO blocked isocyanate for coatings and ink and toners. However, all blocked isocyanates (except intermediates) are most probably used to cover articles. Therefore, for all substances for which coating of an article can be anticipated, they are marked as “(A)” in the table on uses (see Annex 2). However, as noted in the ARN for Isocyanates, exposure to isocyanates from the final cured articles e.g. flexible and rigid polyurethane and elastomers during their normal application is unlikely.

2 Conclusions and proposed 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 1: Conclusions and proposed actions

Subgroup name, EC number, substance name	Human Health Hazard	Environmental Hazard	Relevant use(s) & exposure potential	Suggested regulatory actions
Subgroup 1A 258-981-8 500-287-7 600-028-9 603-188-8 605-318-9 606-423-2 607-997-7 617-779-3 935-560-3	Blocked isocyanates: Known or potential hazard for STOT RE for skin sensitisation (List 617-779-3 only) Unblocked isocyanates releasing MEKO or acetone oxime during curing (EC/Lists 500-287-7, 600-028-9, 617-779-3): Known or potential hazard for carcinogenicity for STOT RE for skin sensitisation	Known or potential hazard for PBT/vPvB for aquatic toxicity (258-981-8 only) Inconclusive hazard for aquatic toxicity for remaining subgroup 1A members	Mainly industrial uses (intermediates, coatings, hardener, cross-linking agents, ink-toner, polymer preparation). In addition, professional uses (e.g. coatings, impregnation) for Lists 607-997-7 and 617-779-3 Only intermediate (List 935-560-3) Consumer exposure from articles not likely	First step: CCH for 258-981-8, 500-287-7, 600-028-9, 603-188-8, 605-318-9, 606-423-2, 607-997-7, 617-779-3 Next steps (if hazard confirmed after data generation): CLH OEL Potential last action: Restriction Justification: Releases to the environment from consumer and widespread professional uses cannot be avoided. Widespread professional uses are typically non-contained and non-automated leading to releases to the environment. Restriction of professional uses is preferred over authorisation as it is considered to be more efficient and

Subgroup name, EC number, substance name	Human Health Hazard	Environmental Hazard	Relevant use(s) & exposure potential	Suggested regulatory actions
				effective to introduce controls at the level of placing on the market rather than at the level of uses. Industrial uses to be considered as part of the restriction. Effects occur at very low concentrations, CLH for STOT RE 1 might not be sufficient to ensure sufficiently low occupational exposure concentrations. Therefore a harmonised OEL or a restriction setting DNEL(s) is proposed to be considered
Subgroup 1B 227-563-7 259-920-8 438-980-0	Inconclusive hazard for STOT RE	Known or potential hazard for PMT/vPvM for aquatic toxicity	Industrial use as adhesive, sealant, polymer preparation, coatings (EC 227-563-7) Not registered (EC/List 259-920-8, 438-980-0)	**First step:** CCH for EC 227-563-7 **Next steps (if hazard confirmed after data generation):** No action **Potential last action:** **Currently no need for EU RRM** <u>Justification:</u> Uncertainty for exposure potential, until clarification of PMT hazard no further action currently proposed
Group 2 690-526-2	Known or potential hazard for reproductive toxicity	No hazard or unlikely hazard for PBT/vPvB Inconclusive hazard for aquatic toxicity	Industrial use as leather treatment product	**First step:** CCH **Next steps (if hazard confirmed after data generation):** No action **Potential last action:** **Currently no need for EU RRM**

Subgroup name, EC number, substance name	Human Health Hazard	Environmental Hazard	Relevant use(s) & exposure potential	Suggested regulatory actions
				Justification: The substance has an appropriate self-classification Repr. 1B and only industrial use for which appropriate RRM are expected to be in place.

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

Suggested regulatory risk management action for all substances in subgroup 1A if PBT/vPvB or STOT RE hazards are confirmed.

Based on currently available information, there are potential hazards for PBT/vPvB and STOT RE hazards due to the potential for release of/exposure from all substances in the subgroup 1A.

Based on ECHA's assessment of hazard information currently available in the registration dossiers all substances of subgroup 1A are **potential PBT/vPvB**.

All substances in subgroup 1A fulfil the PBT/vPvB screening criteria[5]. They all screen for P and B, with very low degradation in the available OECD TG 301 studies (0%-23% degradation in 28-days) and they have a high potential to partition to lipid storage as at least some constituents have logKow higher than 4.5 (up to logKow 9.6). They potentially meet the T criteria set in Annex XIII based on the mammalian data indicating potential STOT RE. There are no biodegradation simulation, bioaccumulation and chronic aquatic toxicity studies available for any of the substances to further substantiate the potential PBT/vPvB hazards.

For EC 258-981-8, which screens for P (0% degradation in 28-days, OECD TG 301D) and B (logKow of 5), and T is already indicated by the results of a chronic fish study in the IUCLID dossier (35-day NOEC 2.25 ug/L, OECD 210). Potential B/vB is contradicted by QSAR prediction provided but the reliability of the prediction is uncertain.

Likely aquatic toxicity hazards are identified for one substance (EC 258-981-8) in subgroup 1A. The data (35-day NOEC for fish: 2.25 ug/L, OECD 210) could warrant classification as Aquatic Chronic 1 (M=10). There is no self-classification applied by the registrants. For other substances in the subgroup 1A, there is no chronic aquatic toxicity data provided and the hazards are inconclusive.

The first step of the regulatory risk management action proposed, should the hazard exist, is to confirm via SVHC identification under REACH and/or CLH under CLP[6] the potential PBT/vPvB properties.

SVHC identification and/or CLH is highly recommended as a step prior to restriction. In addition, SVHC identification brings immediate obligations for suppliers of the substances such as (i) supplying a safety data sheet and communicating on the safe use of the substances, (ii) responding to consumer requests within 45 days and (iii) notifying ECHA if the article they produce contains the substance above regulatory threshold.

Confirmation of the hazard properties via SVHC identification and/or CLH is not considered sufficient to minimise potential releases of the substances in the

[5] As defined in REACH Annex XIII and R11 Guidance on PBT assessment (https://echa.europa.eu/documents/10162/17224/information_requirements_r11_en.pdf/a8cce23f-a65a-46d2-ac68-92fee1f9e54f

[6] The hazard classes PBT/vPvB, PMT/vPvM, ED have been introduced in CLP: CLP Delegated Act (europa.eu). Therefore, instead of SVHC identification under REACH, these hazards may be confirmed via CLH. It is not clear when to use which legal route (SVHC under REACH or CLH under CLP) during the period that both legal options are available.

environment. A restriction is seen as the most appropriate option as potential for exposure is expected from professional uses and industrial uses.

A restriction could address the PBT/vPvB properties of subgroup 1A from industrial and professional uses of the blocked diisocyanates and potential releases to the environment before curing. Once cured, the substances will no longer be present; release to the environment of the polymerized isocyanate moieties is unlikely; the blocking agents will either remain in the polymer (e.g. caprolactam) or may potentially be vaporised and released to the air (e.g. MEKO; acetone oxime). For the potentially released blocking agents the PBT/vPvB criteria are not met.

Widespread professional uses are typically non-contained and non-automated leading to releases to the environment.

Furthermore, potential for exposure and releases to the environment from industrial uses is uncertain based on available information.

Therefore, a restriction of the substances as such or in mixtures (concentration limit in mixtures) used by professional and industrial workers is suggested after SVHC identification and/or CLH, with the aim to minimise emission to the environment and exposure to humans.

The use of PBT/vPvB substances by professional workers has been recognised as an area of concern under the European Commission's Chemicals Strategy for Sustainability[Error! Bookmark not defined.].

It is suggested to cover possibly also industrial uses as part of the restriction. However, the need for authorisation might be considered for industrial uses excluded from the scope of the restriction as it may not be proportionate to restrict all uses.

If hazards are confirmed, within the restriction process the following additional hazard identified for human health for subgroup 1A can be further considered including setting occupational exposure limits.

All substances of subgroup 1A are either confirmed or can be expected to lead to lung damage meeting classification criteria for **STOT RE** 1 or 2 following prolonged inhalation exposure. This is based on available sub-chronic inhalation studies for List 605-318-9, 500-287-7 and 617-779-3 and by extrapolation to List 603-188-8, 606-423-2, 607-997-7, 600-028-9 and 935-560-3.

Due to the severe effects on the lungs observed in sub-chronic inhalation studies for three substances of subgroup 1A with self-classification STOT RE 1 or 2 and extrapolation of the (potential) hazard to all substances of this subgroup (except EC 258-981-8), a harmonised classification for all substances of subgroup 1A could be considered, after compliance checks to verify the hazards for the substances without inhalation studies or without appropriate extrapolation to an inhalation study. Priority for harmonised classification for STOT RE might be limited due to mainly industrial uses and existing self-classifications for some substances of this group. However, a harmonised classification may be preferrable to conclude on PBT/vPvB.

Since the effects occur at very low concentrations, a harmonised classification might not be sufficient to ensure sufficiently low occupational exposure concentrations. A harmonised OEL or a restriction setting DNEL(s) is proposed to be considered for subgroup 1A substances due to adverse health effects on the lung following prolonged exposure, high workers exposure (based on the high aggregated tonnages), and the possibility to control workers exposure in industrial settings.

Human health hazards are also expected from unblocking (curing) isocyanates. Unblocking ('curing') is performed mainly at industrial but also professional settings.

While curing the deblocked diisocyanate moieties polymerize. Due to the elevated curing temperature, the blocking agents may be released to the air (volatised) and be potentially inhalable. For caprolactam (boiling point 271°C, curing temperature 170°C) information was identified that it will not volatise after unblocking and is able to act as a plasticizer (Rolph et al., 2016[7]). For DMP, which is self-classified for Repr. 2 and STOT RE 2 (liver), the boiling point of 220°C is much higher than the curing temperature of 115°C; therefore, there is uncertainty if relevant DMP will be release to air during curing. However, for MEKO and acetone oxime, two oximes with carcinogenic, skin sensitising and blood-system damaging properties, the boiling points are only slightly higher (>152°C and 134°C, respectively) than the curing temperature, which is indicated to be 135°C for MEKO. Therefore, there is a potential for exposure to those substances during curing and those substances are considered for further regulatory needs in addition to the blocked isocyanates for the indicated uses.

In this regard, the risks from oxime release have already been identified in a Risk Management Option Analysis Conclusion Document performed by German CA that was published in 2021[8].

A restriction might also be proposed for professional uses of subgroup 1A blocked isocyanates in case risks could be identified. Risks could occur during handling of the unblocked isocyanates (repeated inhalation of the substances e.g. as dusts) and during curing in case hazardous blocking agents (e.g. DMP, 2-butanone-oxime, acetone oxime) are released and inhaled.

All group members are generally unlikely skin sensitisers (with the exception of List 617-779-3 which is self-classified based on an *in vivo* study), unlikely mutagenic or carcinogenic and unlikely toxic to reproduction (with the exception of List 690-526-2) based on the available data for the blocked substances. Negative skin sensitisation and genotoxicity studies are available for all group members (except the intermediate List 935-560-3 and not registered EC 259-920-8). For reproductive and developmental toxicity in the available studies no adverse effects were noted. So far, no triggers for carcinogenicity were noted from the available systemic toxicity studies.

Compliance check of all substances in subgroup 1A (except EC 935-560-3 which is registered as intermediate) and for one substance of 1B (EC 227-563-7) is proposed.

Currently no need to suggest (further) regulatory risk management actions for EC 259-920-8, 438-980-0, 227-563-7 in subgroup 1B and for EC 690-526-2 of the substance in group 2.

No EU regulatory risk management action is currently proposed for substances EC 259-920-8 and 438-980-0 as they are not considered registered and there is no exposure potential. The strategy may need to be revisited and need for further regulatory action reconsidered if there is a change in the registration status or reported uses for any of these substances.

[7] Blocked isocyanates: from analytical and experimental considerations to non-polyurethane applications - Polymer Chemistry (RSC Publishing) DOI:10.1039/C6PY01776B

[8] a43b98e9-2bd7-daaf-ee3e-716b105a36cb (europa.eu)

EC 227-563-7, 259-920-8 and 438-980-0 in subgroup 1B substances are potentially persistent, mobile and potentially toxic. Substance EC 227-563-7 screens for P (1% degradation in 28-days, OECD TG 301D) and M (logKow 2.702). Substance EC 438-980-0 screens for P (0% in 28-days, OECD TG 301F) and M (logKow 4.3). No further information is submitted besides the screening information. Based on ECHA's assessment, PMT hazard is preliminary extrapolated, to EC 259-920-8 in subgroup 1B based on common structural features however the identified hazard is extrapolated to structural similar subgroup members for which hazard information is not (yet) available and the presence of additional ring structure that might affect the hazard extrapolation. These three substances are inconclusive for STOT RE, and are considered unlikely CMR, ED based on structural similarity with other group members. Only for substance EC 227-563-7 further information can be requested to confirm the hazard. There is remaining uncertainty regarding potential for release to surface waters, soil and ground water from the reported uses of this substance; from the available information high potential for release is not expected, therefore currently only CCH is proposed for this substance and no further action (CLH) at this stage. For the two remaining substances of subgroup 1B, no further information can be requested and therefore, no further action is proposed as there is also no exposure potential.

Likely aquatic toxicity hazards are identified for EC 227-563-7 with self-classification Aquatic Chronic 3 and for EC 438-980-0 in subgroup 1B. For EC 438-980-0 the acute daphnia data (48-h EC50 0.36 mg/L, OECD 202) could warrant classification as Aquatic Acute 1 and Chronic 1. There is no self-classification applied. However, the substance is not considered registered and no further action is proposed. For EC 259-920-8 for which no data on aquatic toxicity is available, potential aquatic toxicity is assumed based on extrapolation to structural similar subgroup members for which hazard information is available with remaining uncertainty.

The only substance of group 2 (List No 690-526-2) is unlikely to fulfil the PBT/vPvB screening criteria, because it is readily biodegradable. This conclusion is based on 100% degradation observed in ready biodegradation test according to OECD TG 301F. To clarify the currently inconclusive hazard for aquatic toxicity, a CCH will be initiated.

The substance of group 2 (List No 690-526-2) has an appropriate self-classification Repr. 1B based on the findings in an available PNDT study. This substance is used only industrially for a specific use (leather treatment) for which appropriate RRM are expected to be in place. Articles once fully cured contain no free diisocyanates and no exposure to the blocked isocyanate is expected. Therefore, no further RRM action is proposed.

Annex 1: Overview of classifications

Data extracted on 14/02/2023.

EC/ List No	CAS No	Substance name	Harmon. classification	Classification in registrations
Subgroup 1A				
258-981-8	54112-23-1	N,N'-(methylenedi-p-phenylene)bis[hexahydro-2-oxo-1H-azepine-1-carboxamide]	-	-
500-287-7	103170-26-9	3-Isocyanato-methyl-3,5,5-trimethylcyclohexyl isocyanate, oligomers, reaction products with 2-butanone oxime	-	STOT RE 1 H372, affected organs: local effects in the respiratory tract
600-028-9	1001254-87-0	Cyclohexane, 5-isocyanato-1-(isocyanatomethyl)-1,3,3-trimethyl-, homopolymer, acetone oxime-blocked	-	Aquatic Chronic 4 H413
603-188-8	127184-53-6	Cyclohexane, 5-isocyanato-1-(isocyanatomethyl)-1,3,3-trimethyl-, homopolymer, caprolactam-blocked	-	STOT RE 1 H372, affected organs: local effects in the respiratory tract
605-318-9	163206-31-3	Hexane, 1,6-diisocyanato-, homopolymer, 3,5-dimethyl-1H-pyrazole-blocked (HDI Trimer, 3,5-dimethylpyrazole blocked)	-	STOT RE 1 H372, affected organs: local effects in the respiratory tract
606-423-2	200295-52-9	Cyclohexane, 5-isocyanato-1-(isocyanatomethyl)-1,3,3-trimethyl-, homopolymer, 3,5-dimethyl-1H-pyrazole-blocked	-	STOT RE 1 H372, affected organs: local effects in the respiratory tract
607-997-7	-	Reaction products of ε-caprolactam with oligomer-risation products of 1,6-diisocyanato-hexane, isocyanurate type	-	STOT RE 1 H372, affected organs: local effects in the respiratory tract
617-779-3	85940-94-9	Hexane, 1,6-diisocyanato-, homopolymer, Me Et ketone oxime-blocked (HDI-polymer methylethylketoxime blocked)	-	Skin Irrit. 2 H315 Skin Sens. 1 H317 STOT Rep. Exp. 2 H373, affected organs: lungs
935-560-3	-	Reaction mass of 3-Isocyanatol-methyl-3,5,5-trimethylcyclohexyl isocyanate (Isophorone diisocyanate) with 4-Methylpentan-2-one oxime.	-	-

Subgroup 1B				
227-563-7	5888-87-9	N,N'-hexane-1,6-diylbis(hexahydro-2-oxo-1H-azepine-1-carboxamide)	-	Aquatic Chronic 3 H412
259-920-8	55954-19-3	hexahydro-N-[3-[[[(hexahydro-2-oxo-1H-azepin-1-yl)carbonyl]amino]methyl]-3,5,5-trimethylcyclohexyl]-2-oxo-1H-azepine-1-carboxamide	-	-
438-980-0	-	ISOKAP		
Group 2				
690-526-2	38632-47-2	Methanesulfonic acid, 1,1'-(1,6-hexanediyldiimino)bis[1-oxo-, sodium salt (1:2)	-	Repr. 1B H360

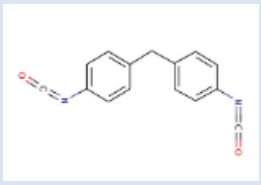
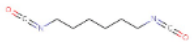
(*) the number in brackets indicates the number of notifications received. Each notification can represent a group of notifiers, therefore the number may differ from the C&L inventory which displays number of notifiers.

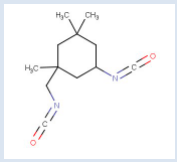
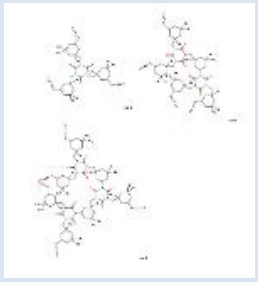
The substances of the assessed group have the following types of isocyanate moieties (either monomer or oligomer) and blocking agents. Since those substances may be released during curing, relevant information e.g. on their hazards (classifications) is presented in the tables below. The hazards that may be relevant for the assessment of regulatory needs are highlighted in red.

Diisocyanate moieties:

- MDI: 4,4'-methylenediphenyl diisocyanate
- HDI: hexamethylene diisocyanate
- IPDI: isophorone diisocyanate

Information on the isocyanate moieties covered in this assessment

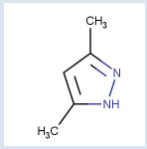
Acronym	EC number	CAS number	Classification
MDI monomer 	202-966-0	101-68-8	Harmonised: Skin Irrit. 2 (H315), Eye Irrit. 2 (H319), Skin Sens. 1 (H317), Acute Tox. 4 (H332), STOT SE 3 (H335), Resp. Sens. 1 (H334), Carc. 2 (H351), STOT RE 2 (H373, respiratory tract)
HDI monomer 	212-485-8	822-06-0	Harmonised: Skin Irrit. 2 (H315), Eye Irrit. 2 (H319), Skin Sens. 1 (H317), Acute Tox. 3 (H331), STOT SE 3 (H335), Resp. Sens. 1 (H334)

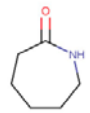
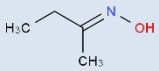
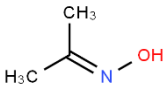
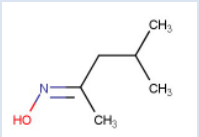
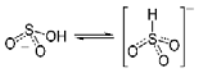
Acronym	EC number	CAS number	Classification
IPDI monomer 	223-861-6	4098-71-9	CLH proposal: Acute Tox 3 (H331), Skin Irrit. 2 (H315), Eye Irrit. 2 (H319), Resp. Sens. 1 (H334), Skin Sens. 1 (H317), STOT SE 3 (H335), Aquatic Chronic 2 (H411)
HDI oligomer, isocyanurate 	931-274-8	-	Notified: Skin Sens. 1 (H317), Acute Tox. 4 (H332), STOT SE 3 (H335)
IPDI oligomer, isocyanurate 	931-312-3	-	Notified: Skin Sens. 1B (H317), STOT SE 3 (H335)

Blocking agents:

- Pyrazole: 3,5-dimethypyrazole (DMP)
- Oximes: butanone oxime (MEKO), acetone oxime, 4-methylpentan-2-one oxime (MIBKO)
- ε-Caprolactam (CL)
- Bisulfite

Information on blocking agents covered in this assessment

Acronym	EC number	CAS number	Boiling point	Classification	PBT criteria
DMP 	200-657-5	67-51-6	220°C	Notified: Acute Tox. 4 (H302), Repr. 2 (H361), STOT RE 2 (H373; liver)	Not met

Acronym	EC number	CAS number	Boiling point	Classification	PBT criteria
CL 	203-313-2	105-60-2	271°C	Harmonised: Acute Tox. 4 (H302), Skin Irrit. 2 (H315), Eye Irrit. 2 (H319), Acute Tox. 4 (H332), STOT SE 3 (H335)	Not met
MEKO 	202-496-6	96-29-7	>152°C	Harmonised: Acute Tox. 3 (H301), Acute Tox. 4 (H312), Skin Irrit. 2 (H315), Eye Dam. 1 (H318), Skin Sens. 1 (H317), STOT SE 3 (H336), Carc. 1B (H350), STOT SE 1 (H370), STOT RE 2 (H373, blood)	Not met
Acetone oxime 	204-820-1	127-06-0	134°C	RAC proposal: Carc. 1B (H350), Acute Tox. 4 (H312), STOT SE 3 (H336), STOT RE 2 (H373, blood), Eye Dam. 1 (H318), Skin Sens. 1 (H317)	Not met
MIBKO 	203-298-2	105-44-2	181°C	Notified: Acute Tox. 4 (H302), Skin Irrit. 2 (H315), Eye Irrit 2 (H319)	Not met
Bisulfite 	231-548-0*	7631-90-5*	-*	Harmonised*: Acute Tox. 4 (H302)	Not met*

*: data for sodium hydrogensulfite

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

Data extracted on 14/02/2023

Main types of applications structured by product or article types	EC/List number, Annex										
	605-318-9	606-423-2	500-287-7	600-028-9	617-779-3	935-560-3	227-563-7	258-981-8	603-188-8	607-997-7	690-526-2
	PY	PY	Ox	Ox	Ox	Ox	CL	CL	CL	CL	BS
	1A	1A	1A	1A	1A	1A	1B	1A	1A	1A	2
PC 20: Products such as ph-regulators, flocculants, precipitants, neutralisation agents											F, I
PC 32: Polymer preparations and compounds							F, I, (A)	F, I, (A)	F, I, (A)	F, I, (A)	
PC 1: Adhesives, sealants					F, I, (A)		F, I, (A)	F, I, (A)		F, (A)	
PC 9b: Fillers, putties, plasters, modelling clay	F, I, (A)				F, I, (A)				I, (A)		
PC 9a: Coatings and paints, thinners, paint removes	F, I, (A)				F, I, **P,** (A)		I, (A)	F, I, (A)		F, I, **P,** (A)	
PC 18: Ink and toners					(A)				F, I, (A)	F, I, (A)	
PC 34: Textile dyes, and impregnating products								F, I, (A)			
PC 23: Leather treatment products											F, I, (A)
PC 21: Laboratory chemicals								I		**P**	
PC 19: Intermediate		F, I	F, I		F, I, (A)	I				I, (A)	

F: formulation, I: industrial use, P: professional use, C: consumer use, A: article service life; (A): Articles once fully cured contain no free diisocyanates and no exposure to the blocked isocyanate is expected; either use of the 'cured' substance in articles(s) reported or to be assumed; P, C and A are highlighted in red to indicate widespread use with potential for exposure/release

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

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