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подкрепа на
Европейския съюз

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Прогноза за сектора до 2030 г. поради неговия преход към кръгова икономика и цифрова трансформация

CENFIM Furnishings Cluster
European Federation of Building and Woodworkers
EFBWW
EFIC European Furniture Industries Confederation
FLA FEDERLEGNOARREDO
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Въздействие на двойния преход върху мебелната индустрия на ЕС

Прогноза за сектора до 2030 г. поради неговия преход към кръгова икономика и цифрова трансформация

CIRCULARFURNITURE-SAWYER.EU

С финансовата подкрепа на Европейския съюз.

Подкрепата на Европейската комисия за изготвянето на тази публикация не е одобрение на съдържанието, което отразява само възгледите на авторите, и Комисията не носи отговорност за каквото и да е използване на съдържащата се в нея информация.

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Тази публикация е създадена с финансовата подкрепа на Европейския съюз.

Този проект е финансиран от инициативата на Европейската комисия: Подкрепа за социалния диалог VP/2018/001. Препратка към безвъзмездно финансиране VS/2019/0027.

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и Комисията не носи отговорност за каквато и да е употреба
на съдържащата се
в нея информация.

Този доклад е изготвен от техническия екип на проекта CENFIM SAWYER, включващ:
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- APMR – Румънска асоциация на производителите на мебели / Румъния
- BBCWFI – Българска браншова камара на дървообработваща и мебелна промишленост / България
- CBM – Търговска асоциация за вътрешни конструкции и мебелна промишленост / Нидерландия
- FCBA – Технологичен институт за горски и мебелни браншове / Франция
- GS – Шведско обединение на работещите в областта на лесовъдството, дървообработката и графиката / Швеция

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Резюме

Двойният преход (зелен и цифров) ще окаже огромно въздействие върху мебелния бранш в ЕС през следващите години и десетилетия. Новата Европейска промишлена стратегия, Европейският зелен пакт и новият План за действие за кръгова икономия ще играят важна роля за промишления преход в ЕС. Проектът SAWYER, изграждайки своя анализ върху предходните резултати на проекта DIGIT-FUR, фокусиран върху въздействието на цифровизацията на сектора до 2025 г., се стреми да **анализира ключовите елементи на промяната на прехода** към **кръгова икономика** в рамките на **мебелния сектор на ЕС до 2030 г.** и **да предвиди разбирането на тези промени**. Това ще предостави полезна информация на **всички социални партньори и заинтересовани страни в сектора** по отношение на това как секторът, неговите бизнес модели и работници ще бъдат засегнати от този преход по цялата негова верига на стойността до 2030 г.

Проектът е изпълнен с участието **на различни партньори (CENFIM, EFBWW, EFIC, FLA,** и **UEA)** и други национални организации (APMR, BBCWFI, CBM, FCBA и GS) с дълъг и значим опит в мебелния сектор. Освен това, други **индивидуални експерти** в областта на кръговата икономика, система за ПТО в ЕС, рисковете за ЗБТ, както и самия мебелен сектор, предоставиха своите експертност и принос по време на цялостното изпълнение на проекта.

SAWYER беше изпълнен, следвайки **методология на прогресивно проучване**. Първоначално бяха идентифицирани основните законови и доброволни инструменти и други политики и стратегии, въздействащи върху прехода на мебелния сектор в ЕС към кръгова икономика. Въз основа на горното са прогнозирани 49 развития на тези инструменти и политики и тяхното ниво на вероятност и въздействие бяха оценени чрез **онлайн проучване** сред 51 експерта от 15 държави. Прогнозираните развития бяха анализирани и прецизирани на **работна среща** с 20 експерта. Резултатите бяха използвани за прогнозиране на сценария за 2030 г. на мебелния сектор в ЕС, в резултат на кръговата икономика.

Този сценарии, изграден върху предходните резултати от проекта DIGIT-FUR и адаптиран към **ReSOLVE рамката** на мебелния бранш, позволи идентифицирането на **очакваните промени в задачите на единадесет ключови професионални профили** в резултат на прехода на сектора към кръгова икономика и цифровизацията на сектора. На база на това бяха идентифицирани новите **рискове, свързани със здравето и безопасността на работното място** и промените в **уменията, познанията и нужните компетенции**.

Всички доклади са налични на адрес:
circularfurniture-sawyer.eu/downloads

Основните резултати от проучването са обобщени по-долу, започвайки с визията на проекта SAWYER, която гласи:

До 2030 г., с широко **цифровизиран мебелен сектор**, базираната на дървообработване мебелна промишленост ще предлага **продукти и услуги** с **дизайн, вземащ предвид околната среда,** базиран на **сурови материали с ниско въздействие и с възможност за проследяване, устойчиви производствени процеси**, и насърчаване на **най-добрите варианти за използване и възстановяване** на материали и отпадни продукти. Клиентите (B2B или B2C) ще улесняват по-подробна информация за продуктите и техните **устойчиви характеристики**, включително индикатори на полезен живот и овластяването на клиента ще бъдат ключът за успеха на целите за кръговост. Властите (на местно, национално и европейско ниво) ще улеснява кръговостта чрез насърчаване на **устойчиви варианти за употреба на отпадни продукти** за материали и продукти от дървесина, като ще разширяват **зелените обществени и частни програми за закупуване** и ще насърчават **политиките за ефективност на материалите**.

При този сценарий в сектора широко ще бъдат използвани **Цифрови инструменти**, както от малките и средни предприятия, така и от големите предприятия, по цялата тяхна верига. Тези цифрови инструменти ще насърчат кръговата икономика, като ще направят **производствените процеси по-ефективни** и ще улеснят **проследимостта** на субстанции, материали и продукти. Клиентите ще бъдат по-добре информирани за **характеристиките на устойчивост** на продуктите и **електронната търговия на мебелни продукти ще се повиши**, което ще провокира промени в маркетинговите дейности и връзката с клиенти, в продажбите и свързаните с това логистични аспекти. Тази рамка ще гарантира, че все повече мебелни производители ще прилагат практики от кръговата икономика, като така направят управленските и производствените си процеси по-устойчиви. Ще нараснат социалните и законовите изисквания към компаниите да понижат своя **екологичен отпечатък** и да подпомогнат справянето с актуалните климатични промени. Кръговостта в сектора е в начална фаза и резултатите ще станат видими в средно- до дългосрочен план.

Двойният преход в мебелния бранш поставя **нови предизвикателства за здравето и безопасността на работното място. Новите типове работни места, новите процеси, новите технологии** и **новите материали/продукти** могат да въздействат върху здравето и безопасността на работниците, но ако бъдат планирани и въведени правилно, **здравето и безопасността на работниците със сигурност ще се подобрят**. Поради тази причина, трябва да гарантираме, че този преход и неговите новите технологии или работни процеси не водят до нови рискове. **Кръговата икономика в сектора**, обръщаща еднакво внимание на здравето и безопасността на работното място и на проблеми трябва да се **въведе чрез по-безопасни и ефективни машини, работни процеси и материали**, които могат да понижат химическите и физически рискове за работниците. Прилагането на

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концепциите за **екологичен дизайн**към продуктите трябва да възстанови дейностите по възстановяване и ремонт, да понижи ергономичните рискове и трябва да понижи съдържанието на опасни вещества, като по този начин ще понижи химическите рискове в цялата верига на стойност. Здравето и безопасността на работниците трябва да се повиши чрез интегрирането на управление на здравето и безопасността на работното място в системите за управление на качеството на компаниите.

За някои професионални профили ще бъдат необходими **нови зелени умения**, тъй като ще има нови, специфични задачи, свързани с разглобяване и повторна употреба, повторно производство, рециклиране и творческо повторно приложение. Тези нови умения са особено важни за задачите на „практическите" профили. Тези нови умения ще имат своето въздействие, имат своето въздействие толкова значително, върху хората, които управляват и вземат стратегически решения в компаниите. В допълнение, **генеричните зелени умения, познания и компетенции** са дефинирани като необходими за социалното, икономическото и екологично развитие в рамките на сектора на дървените мебели. Тези генерични зелени умения вървят заедно с ключови компетенции или меки умения, които са контекстуализирани в рамките на перспективата на екологичната осведоменост и разбирането на устойчивото развитие и кръговата икономика.

Резултатите на проекта ще улеснят и подпомогнат социалния диалог между ключови играчи и заинтересовани страни и ще им помогнат за правилното подпомагане на двойния преход в мебелния бранш и със справянето с предизвикателствата през следващите години и ще **осигурят заетостта и безопасността на работниците и конкурентоспособността на компаниите**.

Увод

Цели

Основната цел на SAWYER е да **разбере и прогнозира** как мебелният сектор в ЕС ще бъде повлиян от прехода **към кръгова икономика** и да предостави полезна информация на **всички социални партньори и заинтересовани страни в сектора** за това как секторът, неговите бизнес модели и неговите работници ще бъдат повлияни от този преход по цялата негова **верига на стойност до 2030 г**. Заедно с изпълнението на проекта, партньорите забелязаха, че този преход към кръговост е тясно свързан с цифровизацията на сектора и решиха да изградят анализа на база на съществуващите резултати от предходния проект DIGIT-FUR, който прогнозира въздействието на цифровизацията върху сектора до 2025 г. В заключение, ключовият резултат от проекта SAWYER е прогнозата на **въздействието от двойния преход (зелен и цифров) на мебелния сектор в ЕС**, принципно във връзка с бизнес моделите на сектора, предоставяне на ПТО и рисковете за ЗБТ, по-специално по отношение на единадесет професионални профила.

Тази прогноза за двоен преход ще улесни заинтересованите страни в сектора по отношение на **очакваните промени,** които са необходими за подобрение и актуализация на компетентностите на работниците и тяхната безопасност на работното място, за да се гарантира конкурентоспособността на мебелите компании в ЕС в рамките на следващите години или дори десетилетия.

Специфичните цели на SAWYER са:

- Разбиране на **актуалното състояние и тенденциите** в мебелния сектор в ЕС по отношение на законодателните и доброволни инструменти, свързани с кръговата икономика.
- Определяне на **възможния бъдещ сценарий за сектора през 2030 г.**поради неговия преход към кръгова икономика.
- Идентификация на **въздействието** на този сценарий **върху задачите в ключови професии в сектора, рисковете за ЗБТ и необходимите умения и познания.**
- Прогноза **какво могат да очакват заинтересованите страни в сектора** вследствие на тези промени и как да се справят с тях.
- Подпомагане на работата на **Европейския социален диалог** и подобряване на европейските промишлени отношения.
- **Картографиране на успешните инициативи** с цел подпомагане на заинтересованите страни в процеса на въвеждане на кръгова икономика.

Методология

Използваната методология при проучването (Фигура 1) е проектирана от екипа на CENFIM SAWYER (M. Rumignani, J. Rodrigo, J. Solana) и външния експерт на проекта по кръгова икономика, Juan Carlos Alonso, и тя беше въведена с помощта на други партньори на SAWYER (FLA, EFBWW, EFIC и UEA), както и на други двама външни експерти за проекта, Jeroen Doom (система за ПТО) и Ellen Schmitz-Felten (рисковете за ЗБТ). Проучването започна с Използваната методология при проучването на **основните законови и доброволни инструменти и други политики и стратегии,** които могат да окажат въздействие върху прехода на мебелния сектор в ЕС към кръгова икономика.

Фигура 1.- Схема на методологията на проекта

С цел подкрепа на този анализ, беше изготвен специализиран доклад за **съвременното състояние на тези инструменти и политики** на европейско ниво в седем държави-членки на ЕС (Испания, Италия, Франция, Нидерландия, Румъния, България и Швеция). Въз основа на горното, бяха прогнозирани 49 развития на тези инструменти и политики и тяхното ниво на вероятност и въздействие беше оценено в **онлайн проучване**, в което участваха 50 европейски професионалисти от 15 държави-членки на ЕС, експерти в кръгова икономика и/или мебелен сектор.

След като резултатите от проучването бяха събрани, обработени и обобщени, 49-те прогнозирани развития бяха анализирани и прецизирани на **работна среща** с 20 професионалисти, от 9 държави-членки на ЕС, с различна експертиза, включвайки експерти от мебелния бранш, екологичния дизайн и специфични законови и доброволни инструменти, свързани с кръговата икономика. Като краен резултат от този процес беше създаден **докладът „Прогнозен сценарии за мебелния сектор във връзка с кръговата икономика през 2030 г.“**. Той прогнозира състоянието на мебелния бранш в ЕС през 2030 г., изграден на базата на прогнозния сценарии за 2025 г. от предходния проект DIGIT-FUR, който анализира въздействието на цифровизацията върху бранша. Резултатът е прогноза и анализ на въздействието на **двойния преход (зелен и цифров)** върху мебелния бранш в ЕС за следващите години и десетилетия.

На базата на тези резултати, експертът по кръгова икономика на проекта, в сътрудничество с екипа на проекта от CENFIM SAWYER и надграждайки резултатите от предходния проект DIGIT-FUR, идентифицираха **очакваните промени в задачите на единадесет ключови професионални профила** поради преминаването на сектора към по-кръгова икономика и цифровизацията на сектора. Анализът беше имплементиран, след неговото адаптираме спрямо **рамката ReSOLVE** на мебелния бранш, която рамка е разработена от McKinsey Center и Ellen MacArthur Foundation. Така че новите прогнозни таблици включват очакваните резултати от двойния преход (Зелен и цифров) на мебелния бранш, което предоставя ясна картина на очакваните бъдещи задачи за всички единадесет професионални профила.

Следващата стъпка беше анализ на актуалните и прогнозни **опасности и рискове за ЗБТ**, в резултат на цифровизацията на бранша и преминаването към кръгова икономика, като се взе предвид преформулирането на задачите, извършвани с предходния анализ за различните професионални профили. В този анализ, различните типове опасности, с които могат да се сблъскат работниците в производствените предприятия за дървени мебели, бяха характеризирани в различни категории на рискове.

Последната стъпка беше анализа как актуалните **нужди от познания, умения и компетенции (КУП)** на работниците и компаниите могат да се променят при цифровизацията на бранша (до 2025 г.) и поради кръговата икономика (до 2030 г.) за седем ключови професионални профила, като се взеха предвид „основните причини за промяна“ за цифровизация и за кръгова икономика и беше извършен анализ дали те ще бъдат необходими повече или не. Този анализ позволява идентифицирането кои нужди от КУП ще понесат промени и какви нови компетенции ще се изискват за кръговата икономика от компаниите в бранша, които желаят да се адаптират към и да използват по подходящ начин възможностите, предлагани от растящата кръговост в сектора.

Надграждайки върху допълнителен анализ и обработка на всички тези резултати, експертите и екипа на SAWYER създадоха набор от **препоръки**, за заинтересованите страни в мебелния бранш и по-специално за създателите на политики, ПТО доставчици и регулаторни органи.

Картографирането на **европейски инициативи**, улесняващи и подпомагащи прехода на индустрията в ЕС към кръгова икономика предоставиха информация относно различни релевантни национални и регионални инициативи.

11-те ключови професионални профила, избрани и анализирани от класификацията на ESCO (Европейска класификация на уменията/способностите, квалификациите и професиите), със съответните ISCO идентификационни кодове, са:

1221 Мениджъри по продажбите и маркетинга
1321s Ръководител на промишленото производство
1324s Ръководител на канала за доставки (доставка, дистрибуция и съответни мениджъри)
2141s Инженер по поддръжка и ремонт (поддръжка на машини и ремонтни работници)
2163s Дизайнери на мебели (дизайнери на продукти и дрехи)
7522 Мебелисти и свързаните с тях работници
7523 Организатори на инструментално оборудване и оператори на дървообработващи машини
7534 Тапицери и свързаните с тях работници
8172 Оператори на дървообработващи машини
8219s Монтажник на мебели
9329 Общи работници

Резултати

Най-новото от кръговата икономика в мебелния сектор на ЕС

Областта на анализ, покрита от проекта SAWYER, е мебелния бранш, който според класификацията на NACE Вер. 2 се отнася към код 31.0 (Производство на мебели). Браншът е с оборот от 110,4 € милиарда и добавена стойност от 32% (според последните данни на 2018 EUROSTAT), което го прави основен сектор за икономиката на ЕС, също така поради заетостта на 1 043 806 работници в бранша (EUROSTAT, 2018). Секторът за производство на мебели в EC28 е съставен основно от микро-, малки и средни предприятия, както е показано в следващата таблица.

Следващата таблица показва данни за работниците в бранша, според основните категории трудови функции и професионални профили, анализирани от проекта SAWYER.

Таблица 1.- Обем на работниците за основните категории в мебелния сектор на ЕС за 2018 г.

Категории трудови функции[1]	Прибл. обем през 2018 г., 1 043 806 работника [2]	Професионални профили, обхванати от проекта SAWYER (ISCO професионални профили)
Мениджъри	80,395	Не са обхванати от това проучване
Специалисти по IT	11,485	Не са обхванати от това проучване
Дизайнери	10,818	2163s Дизайнер на мебели
Ръководител на производство	22,970	1321s Ръководител на промишленото производство
Персонал по продажбите и маркетинга	22,970	1221 Мениджъри по продажбите и маркетинга + допълнителни профили не са обхванати от това проучване
Ръководителите на доставки	10,818	1324s Ръководител на доставки
Административен помощен персонал	114,851	Не са обхванати от това проучване
Работници по техническото обслужване на оборудването и машините	68,910	2141s Инженер по техническо обслужване и ремонта + допълнителни профили, които не са обхванати от това проучване
Квалифицирани занаятчии (Мебелисти и тапицери)	574,255	7522 Мебелисти и свързаните с тях работници
		7534 Тапицери и свързаните с тях работници
		8219S Монтажник на мебели
Оператори на машини	45,941	7523 Организатори на инструментално оборудване и оператори на дървообработващи машини
		8172 Оператори на дървообработваща машина
Работници	80,395	9329 Общи работници

[1]Категории трудови функции от проучването TNO, ZSI, SEOR (2009), ЕО.
[2]На базата на обработка на данни от EUROSTAT за общия брой на работници за мебелния сектор на EC28.

След идентификацията на набор на **основни законодателни и доброволни инструменти** и други **политики** и стратегии, оказващи въздействие върху прехода на мебелния бранш на ЕС **към по-кръгова икономика**, е направен подробен анализ на тяхното ниво на приложение.

В първия доклад по проекта „Най-новото от кръговата икономика в мебелния сектор", изготвен до месец ноември 2019 г., сдружението приложи подробен анализ на всички тези елементи и на тяхното ниво на употреба, както на ниво ЕС, след което, по-специално, на ниво някои държави-членки на ЕС (Испания, Италия, Франция, Нидерландия, Румъния, България и Швеция). Това свързано познание се приема за необходимо от сдружението за правилното разбиране и прогнозиране на развитието на кръговата икономика в бранша.

Избрани инструменти бяха групирани в три различни групи: законови и доброволни инструменти и други политики и стратегии. Тяхното подробно описание и резултатите от анализа бяха събрани три различни документа:

- Най-новото от кръговата икономика в мебелния сектор на ниво ЕС
- Най-новото от кръговата икономика в мебелния сектор в 7 държави-членки на ЕС
- Обобщителна таблица: Актуализация на най-новото от кръговата икономика в мебелния сектор на ниво ЕС

Всички тези документи могат да бъдат изтеглени от уеб страницата на проекта SAWYER: circularfurniture-sawyer.eu/downloads

Следващата таблица показва списък на избраните инструменти и политики и тяхното оценено ниво на приложение на ниво ЕС, по скалата от 1 до 5 (1 = минимална стойност и 5 = максимална стойност).

Таблица 2.- Списък на избрани инструменти и политики, и тяхното ниво на въвеждане на ниво ЕС

Инструмент	Описание	Ниво на приложение
Законодателни инструменти		
Пакет за кръгова икономика за ЕО	План за действие за кръгова икономика (COM (2015) 614) насочен към подсилване на въвеждането на кръгова икономика в Европа. Той включва преразглеждане на някои регламенти (напр. рамката за отпадъците) и нови действия за подпомагане на кръговостта (напр. стратегия за пластмаса).	**5** Всички от 54-те предложени действия са завършени или се намират във фаза на приложение {SWD(2019) 90 финален}.
Европейски зелен пакт	Европейският зелен пакт (COM(2019) 640 финален и Анекс) е пътната карта за ЕС, която ще направи икономиката на ЕС по-устойчива с дейности за: • подсилване на ефективното използване на ресурси чрез преминаване към чиста, кръгова икономика • възстановяване на биоразнообразието и намаляване на замърсяването • Целта е ЕС да бъде климатично неутрална през 2050 г., като преходът ще бъде направен справедлив и приобщаващ за всички. Това ще изисква действие от всички браншове на икономиката на ЕС, включително: • инвестиции в екологични технологии • подпомагане на промишлеността за иновации • използване на форми на по-чист, по-евтин и по-здравословен частен и обществен транспорт • декарбонизиране на енергийния сектор • гарантиране, че сградите са по-енергийно ефективни • работа с международни партньори за подобряване на световните екологични стандарти	**2** В точка 2.1.3. Мобилизирайки промишлеността за чиста и кръгова икономика, се съобщава, че Комисията ще приеме промишлена стратегия за ЕС и ще публикува нов План за действие за кръгова икономика, като стълбове на този Зелен пакт за ЕС (направено през месец март 2020 г.). Приложението към Комуникацията по отношение на Европейския зелен пакт определя Пътна карта и ключови действия за периода 2019 до 2021 г. Тези ключови действия са класифицирани в следните аспекти: • Климатична амбиция • Чиста, достъпна и сигурна енергия • Промишлена стратегия за чиста и кръгова икономика • Устойчива и интелигентна мобилност • Озеленяване на общата земеделска политика / Стратегия „От фермата до масата“ • Запазване и защита на биоразнообразието • Амбиция насочена към нулево замърсяване за околна среда без токсини • Интегриране на устойчивостта в политиките на ЕС • ЕС като глобален лидер • Да работим заедно – Европейски климатичен пакт
Нов план за действие за кръгова икономика за по-чиста и по-конкурентна Европа	Новият план за действие за кръгова икономика (COM(2020) 98 финален и приложение) обявява инициативи, свързани с целия житейски цикъл на продуктите, насочени, например към техния дизайн, като насърчава процесите на кръгова икономика, устойчива консумация и цели да гарантира, че използваните ресурси се задържат в икономиката на ЕС възможно най-дълго.	**1** Планът указва в своя Анекс срока за предложените инициативи, от 2020 до 2023 г. Ключовите действия са класифицирани в следните аспекти: • Политическа рамка за устойчиви продукти • Ключови вериги на стойност за продукти • По-малко отпадъци, повече стойност • Осъществяване на работа на кръговостта за хората, регионите и градовете • Пресичане на действия • Водещи усилия на глобално ниво • Наблюдение на напредъка
Директива относно отпадъци от електрическо и електронно оборудване (OEEO)	Директивата 2012/19/ЕО разглежда създаването на програми за събиране (безплатни за консуматорите), за да се повиши повторното използване и/или рециклиране на OEEO.	**5** Предходната OEEO директива влезе в сила през 2003 г. През 2017 г., комисията прие „OEEO пакет“ и през 2018 г., окончателен доклад на тема насърчаване на спазването на OEEO, като беше изследвано приложението във всяка държава-членка на ЕС.
Ограничаване на опасните вещества в електрическо и електронно оборудване (ROHS)	Директива 2011/65/ЕС беше изменена от Директива (ЕС) 2017/2102, преглеждайки обхвата за еднаква група продукти и предоставяща улеснения с цел окуражаването на по-кръгова икономика в Съюза чрез насърчаване на дейностите на вторични пазари за ЕЕО, което включва ремонт, замяна на резервни части, възстановяване и повторна употреба и преоборудване.	**5** Предходната ROHS директива влезе в сила през 2003 г. Тя беше ревизирана няколко пъти с цел модификация на изключенията и крайните срокове.

Инструмент	Описание	Ниво на приложение
Директива за продукти, свързани с енергия (ErP или екологичен дизайн)	Директивата 2009/125/ЕО е рамката, дефинираща изискванията за екологичен дизайн на продукти, които използват енергия или са свързани с енергия (т.е. те не консумират пряко енергия, но могат да провокират използването на допълнителна енергия, като прозорци).	**4** ЕО публикува работни планове с цел идентификация на приоритетни семейства продукти и бъдещи стратегии. Най-актуалния работен план покрива периода 2016-2019 г. и обръща повече внимание на ефективността на ресурсите, анализирайки възможното приложение на допълнителни „специфични за продукта" изисквания по въпроси, свързани с устойчивост и т.н.
Удължена отговорност на производителя (EPR)	Удължената отговорност на производителя (EPR) е „подход за екологична политика, при който отговорността на производителя се удължава до след-клиентския етап на жизнения цикъл на продукта".	**4** Съществуващите директиви на ниво ЕС за някои специфични продукти (ЕЕО, батерии, превозни средства на края на своя живот, опаковки и т.н.). На национално ниво, EPR програми за други продукти.
Опасни вещества / REACH регламент	REACH регламентът (ЕО 1907/2006) цели подобряване на човешкото здраве и защитата на околната среда чрез идентификация на опасните свойства на химическите вещества, използвани в ЕС. Както производителите, така и вносителите имат отговорността да съберат информация за специфични и критични свойства на химическите вещества, използвани от тях.	**3** REACH е напълно работеща, но изостава от първоначалните очаквания. Някои от идентифицираните проблеми са липсата на съответстваща информация в досиетата по регистрация или необходимостта от опростяване на процеса за разрешаване на употреба.
Емисии на формалдехид	Формалдехидът, който се произвежда и внася на европейско ниво се използва основно за производството на смоли, използвани за производството на панели, базирани на дърво. Излагането на емисии на формалдехид е важен проблем за консуматорите (емисии от продукти) и за работниците (професионално излагане).	**2** На европейско ниво липсва общо законово изискване, но съществува доброволно промишлено споразумение на членовете на Европейската панелна федерация (EPF), които произвеждат само панели, базирани на дърво, от клас E1. Някои държави-членки на ЕС са приели национални законодателства.
Правила на ЕС по отношение на критерии за отпадъци в края на живота на продукти	Директивата за рамка за отпадъци 2008/98/ЕО указва, че някои специфични отпадъци трябва вече да не бъдат разглеждани ако обичайни отпадъци, ако те са преминали през процес на възстановяване (включително рециклиране) и ако те отговаря на специфични критерии, разработени в съответствие с определени законови условия. Целта е да се отстрани административния товар на законодателството за отпадъци за безопасни и висококачествени отпадни материали, с цел улесняване на тяхното рециклиране.	**3** На европейско ниво, съществуват дефинирани критерии за 8 типа отпадъци, но липсват специфични регламенти за желязо, стомана, мед и алуминиев скрап и за стъклени трошки.
Забавители на горенето	Някои мебелни продукти използват забавители на горенето, за да изпълнят множеството стандарти за запалимост на мебели. Някои от тези стандарти изискват съответствие с изпитвания с открит пламък, което налага използването на забавители на горенето. Някои типове вещества, използвани за забавители на горенето, са регламентирани според Регламент (ЕО) 2019/1021, който преработва Регламент (ЕО) 850/2004 относно устойчиви органични замърсители (УОЗ).	**3** Използването на забавители на горенето не е пряко регулирано на европейско ниво. Непряко, то е регулирано, ако използваните вещества се смятат за опасно (напр. чрез REACH или УОЗ регламент). Споменатите регламенти се използват добре и се проучват нови вещества.
Директива за възобновяема енергия (RED II)	През месец декември 2018 г. влезе в сила ревизираната директива 2018/2001/ЕО за възобновяема енергия, като част от пакета Чиста енергия за всички европейци. Тя установява нова, обвързваща цел за възобновяема енергия за ЕС за 2030 г., която трябва да достигне до 32%, с клауза за възможен преглед за повишение на този процент до 2023 г. Директивата за възобновяема енергия задава критерии за устойчивост за всички био-горива, които се произвеждат или консумират в ЕС.	**4** Директивата е въведена и се разглеждат по-амбициозни цели за възобновяема енергия. По отношение на устойчивостта на био-горивата, компаниите могат да покажат, че отговарят на критериите за устойчивост чрез национални системи или така наречените доброволни програми, които се признават от Европейската комисия.
Незаконна сеч и незаконна търговия с дървесина	Регламент (ЕС) № 995/2010 определя задълженията на операторите, които продават или разпространяват дървесина и продукти от дървесина. Регламентът е познат като ЕС регламент за дървесина или EUTR, като част от ЕС Плана за действие за гори, законодателство, изпълнение, управление и търговия (FLEGT). Друга програма е Конвенция за международна търговия на застрашени видове на дива флора и фауна (CITES).	**5** Тези регламенти и планове за действие са въведени на ЕС и международно ниво. Публикувани са и нови планове за действие за защита на горите, например COM(2019) 352 относно „Засилване на действията на ЕС за защита и възстановяване на световните гори", предлагащ създаването на европейска обсерватория за обезлесяване и упадък на горите.

КЪМ ИНДЕКС

Инструмент	Описание	Ниво на приложение
Доброволни инструменти		
Зелени обществени поръчки (GPP)	Зелените обществени поръчки включват екологични критерии в спецификациите на обществените поръчки, включващи интегрирането на екологични компоненти в решенията за възлагане на обществени поръчки. Тези екологични критерии могат да покриват различни аспекти на продукта през неговия житейски цикъл. GPP може да подпомогне създаването на критична маса на търсене на по-устойчиви стоки и услуги, които, в противен случай не биха могли да пробият на пазара лесно	**3** Нивото на реално приложение е различно във всяка държава-членка на ЕС. Европейската комисия и няколко държави-членки на ЕС са изготвили различни насоки за GPP процеси, под формата на национални GPP критерии. Основните предизвикателства се състоят в това да се осигурят съвместими GPP изисквания между различните държави-членки на ЕС и да се окаже помощ на повече обществени органи при приемането на тези критерии.
Управление на околната среда в организации	Системата за управление на околната среда (СУОС) може да помогне на организациите при идентификацията, управлението, наблюдението и контрола на техните екологични аспекти по „холистичен" начин. На европейско ниво има две основни сертифицирани системи за управление на околната среда, които са EMAS и ISO-14001:2015.	**4** Публикувани са различни версии на програмите по ISO и EMAS. Те представляват консолидирани програми, но са частично приложени в бизнес сектора. На европейско ниво, 3 728 организации имат сертификация по EMAS (април 2019 г.) и 111 133 организации имат сертификация по ISO-14001 (2017 г/).
Методология на екологичен дизайн	Екологичният дизайн се дефинира като „интеграция на екологични аспекти в дизайна и разработката на продукта, с цел понижение на отрицателните въздействия върху околната среда през целия жизнен цикъл на продукта" UNE-EN ISO 14006:2020 предоставя насоки, които да помогнат на организациите при създаване, документиране, въвеждане, поддържане и постоянно подобрение на тяхното управление на екологичния дизайн, като част от EMS. Има и други стандарти, свързани с екологичния дизайн, като UNE-ISO/ TR 14062:2007 или IEC 62430:2019	**3** Последната редакция на ISO 14006 се извърши през 2020 г. Стандартът указва, че не е предназначен за сертификационни цели, което затруднява разбирането на реалното ниво на неговото въвеждане на пазара. При всички случаи се приема, че въвеждането на този стандарт е много по-ниско в сравнение с въвеждането на ISO-14001.
Екологични етикети (Тип I, II и III)	Екологичните етикети се опитват да предоставят информация на потребителите по отношение на екологичните характеристики на даден продукт. Има огромно количество от екологични етикети, но всички те могат да бъдат групирани в три основни типа екологични етикети (т.е. I, II и III) и те се регулират по ISO 14020.	**4** Различните системи за екологични етикети са добре развити и са широко използвани при някои типове продукти (напр. потребителски продукти). Но е необходима допълнителна работа за осигуряване на по-добра информираност на потребителя относно реалното значение на тези екологични етикети, за да се избегне заблуда.
Сертифициране във връзка с верига за проследимост на доставките (FSC / PEFC)	Сертифицирането във връзка с верига за проследимост на доставките при доставката на дървесина предоставя доказателства, че сертифицираният продукт произхожда от сертифицирани, добре управлявани гори. Той удостоверява и гарантира, че тези продукти не се смесват с други продукти, идващи от несертифицирани гори, в нито една точка от веригата за доставки, с изключение на случаите, когато се прилага стриктен контрол и се използва етикетиране, обозначаващо процентно (%) съдържание. В момента има две независими програми за проследимост на доставките, които са активни в дървообработващия бранш: Програмите на FSC (Forest Stewardship Council) и PEFC (Програма за прилагане на сертифициране на гори).	**5** Тези две програми са добре развити и търсенето на сертифициране във връзка с веригата на проследимост на доставките е нараснало значително през последните три години до такава степен, че за много компании възможността да докажат, че техният продукт от е получен от добре управляван източник, вече е ключов фактор в спецификацията на дървените и хартиени продукти.
Сертифициране на зелени сгради (BREEAM / LEED)	Има две основни програми за сертифициране на зелени сгради: Building Research Establishment's Environmental Assessment Method (BREEAM), който представлява първата система за оценка на зелени сгради, разработен в Обединено кралство, и Leadership in Energy and Environmental Design (LEED), разработен наскоро в САЩ от Green Building Council (USGBC).	**4** Тези две програми са добре приложени на ниво ЕС. Например в държавите-членки на ЕС са издадени сертификати за 19 542 BREEAM оценки (повечето в Обединено кралство) и съществуват 3 766 проекта, сертифицирани по LEED. Има нарастващо търсене на този тип сертифициране, но то все още се прилага за малка част от сградите в строителния сектор.

Инструмент	Описание	Ниво на приложение
Други инструменти и политики		
каскадно използване на дърво	каскадно използване на ресурси от био-маса, като дърво и земеделски продукти, означава ефективна употреба на тези ресурси от гледна точка на природни ресурси, материали и консумация на земя. Този процес предоставя приоритет на употреби с висока стойност, които позволяват повторната употреба и рециклиране на продукти и сурови материали, насърчавайки използването на енергия само, когато други методи са неприложими.	**2** Европейската комисия е направила две публикации по този въпрос, включително Насоки за каскадно използване на био-маса. До момента липсват други изисквания, свързани с темата.
Промишлена политика на ЕС за лесовъдство	Европейската комисия е приела Стратегия за горите в ЕС през 2013 г. (COM(2013) 659 финална), насочена към подпомагане на горите и свързания сектор при справянето с актуалните предизвикателства. Стратегията предоставя рамка за реакция на повишаващите се изисквания, поставени върху горите и за справяне със социалните и политическите промени. Стратегията за горите на ЕС 2014-2020 г. е разработена с цел осигуряването на кохерентна рамка както за политиките, свързани с горите на ЕС, така и за националните политики за горите на отделните държави членки на ЕС.	**4** През 2018 г., Комисията изготви доклад „Напредък при прилагането на стратегията за горите в ЕС“ (COM(2018) 811 финален), разглеждайки тази стратегия. Прегледът подчертава, че стратегията за горите на ЕС постига своята цел да подпомогне по-устойчиво управление на горите на ЕС и световно ниво.
Пътна карта за брашновете, свързани с гори	През 2013 г., Европейската комисия публикува Пътна карта за браншовете, свързани с гори в ЕС (SWD(2013) 343 финална). Този документ придружава Стратегията за горите в ЕО и подчертава предизвикателствата, с които трябва да се занимаят браншовете, свързани с гори, за да останат конкурентоспособни.	**3** Идентифицирани са някои дейности, които да подпомогнат справянето с тези предизвикателства за периода 2014-2020. Група от организации предостави своята споделена визия и програма до 2050 г. за браншовете, свързани с горите.
Био-икономика	Целта на био-икономиката е постигането на по-иновативна и по-ниско емисионна икономика, която да интегрира изискванията за устойчиво земеделие и рибовъдство, сигурност на храните и устойчива употреба на възобновяемите биологични ресурси за промишлени цели, като същевременно гарантира биоразнообразието и защитата на околната среда.	**3** Европейската комисия е създала Стратегия за био-икономика и план за действие, публикувани през 2012 г. и ревизирани през 2018 г. Актуализацията предостави проект за план за действие, съдържащ 14 конкретни действия, които да бъдат започнати през 2019 г. Освен това, Комисията работи по въпроса за осигуряване на кохерентен подход към био-икономиката чрез различни програми и инструменти (напр. Horizon 2020, BBI и т.н.).

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Прогнозиране: резултати от проучването и семинара

Следваща стъпка по проекта бе организирането на **прогнозно онлайн проучване и работна среща на експерти**. Проучването беше извършено сред 50 професионалисти от 15 държави-членки на ЕС и беше подпомогнато от подготвения преди това доклад за актуалното състояние. Експерти по кръгова икономика и/или в мебелния бранш трябваше да оценят нивото на вероятност и въздействието на 49 прогнозни развития, очаквани до 2030 г. и свързани с предходно идентифицираните въздействащи инструменти и политики.

Целите на проучването бяха:

- Идентифициране на това **кои развития са по-вероятни** да се случат до **2030 г**.
- Създаване на **първи чернови списък на най-въздействащите ситуации, с които ще се сблъска браншът до 2030 г**.

Резултатите от проучването позволиха класифицирането на тези 49 прогнозни развития по отношение на тяхната **вероятност** от поява и връзката на тяхното **въздействие** върху прехода на сектора към по-кръгова икономика, показвайки на заинтересованите страни от сектора кои от тези инструменти изискват повече внимание с цел правилното справяне с предизвикателствата, поставени от прехода към кръгова икономика.

След като резултатите от проучването бяха събрани, обработени и обобщени, те бяха анализирани и дискутирани през месец декември 2019 г. на специална работна среща с 20 професионалисти, идващи от 9 държави-членки на ЕС, с различна експертиза, включвайки експерти от мебелния бранш, екологичния дизайн и специфично законодателство, свързани с кръговата икономика. Съвместната мозъчна атака и приноса на експертите ни помогнаха да актуализираме и прецизираме 49-те прогнозирани развития и да подобрим прогнозата за това как ще се развие браншът до 2030 г.

Като краен резултат от тези процеси беше създаден **докладът „Прогнозен сценарии за мебелния сектор във връзка с кръговата икономика през 2030 г.“**. Той съдържа прогнозния сценарии за въздействието върху прехода на сектора към по-кръгова икономика, изграден на базата на предходния прогнозен сценарий, разработен от проекта DIGIT-FUR, фокусиращ се върху цифровата трансформация на сектора до 2025 г. Новата прогноза може да стимулира по-цялостно мислене по отношение на бъдещите стратегически дейности и инвестиции. Визията е следната:

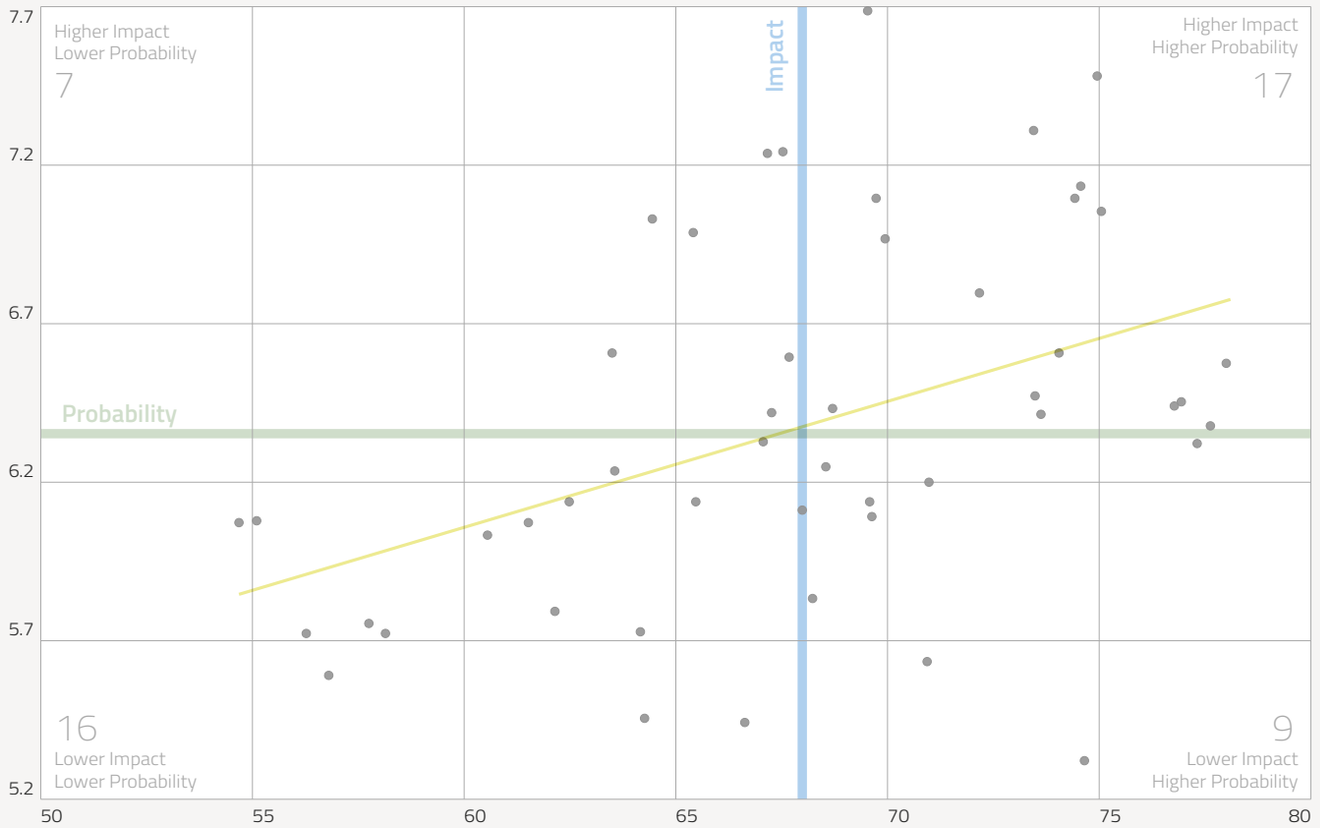
*До 2030 г., с широко**цифровизиран мебелен сектор**, базираната на дървообработка мебелна промишленост ще предлага**продукти и услуги** с **дизайн, вземащ предвид околната среда,**базиран на**сурови материали с ниско въздействие и с възможност за проследяване, устойчиви производствени процеси**, и насърчаване **на най-добрите варианти за използване и възстановяване** на материали и отпадни продукти. Клиентите (B2B или B2C) ще изискват по-подробна информация за продуктите и техните**устойчиви характеристики**, включително индикатори на полезен живот и овластяването на клиента ще бъде ключът за успеха на целите за кръговост. Властите (на местно, национално и европейско ниво) ще улеснят кръговостта чрез насърчаване **на устойчиви варианти за употреба на отпадни продукти** за материали и продукти от дървесина, като ще разширят **зелените обществени и частни програми за закупуване** и ще насърчават **политиките за ефективност на материалите.***

Тази визия ясно показва **близката връзка между прехода на бранша към по-кръгова икономика и неговата цифрова трансформация**. Тези две развития комбинират силни и дългосрочни въздействия едно върху друго и само **съвместен анализ** на техните въздействия може да предостави реалистична и полезна прогноза за това как ще се развива мебелният бранш през следващите години и десетилетия и по този начин правилно да се **подпомогнат стратегическите решения на заинтересованите страни в сектора**.

Пълните доклади могат да се прочетат на адрес: circularfurniture-sawyer.eu/downloads/

Графиката показва, че няма ясна връзка между въздействието и вероятността на развитията и че ни липсват развития със стойности на въздействие по-ниски от 5 или по-високи от 8 по използваната скала от 0–10.

Фигура 2.- Разпределение на 49-те прогнозирания развития по отношение на тяхната вероятност и стойности на въздействие.



In the following table, we present the 49 forecasted evolutions ranked according to their level of importance (impact x probability) as outcome of the survey results.

Table 3.- Classification of forecasted evolutions 2030 - workshop results.

Class	Instrument	**Forecasted Evolution** Importance = Probability x Impact. Probability: scale 1 - 100. Impact: scale 1 - 10	**Importance**	Probability Mean Value	Probability Standard devation	Impact Mean Value	Impact Standard devation
1	ECD	The furniture is designed to reduce the impact of used raw materials (use of recycled materials, reduction of hazardous substances content, use of wood with lower environmental impact, use of proximity wood, etc.), provoking changes in the supply chains of companies and in the managing of old furniture collected when the new one is delivered, generating new business models.	561	75	15	7,48	1,61
2	ECD	Low, medium and high quality furniture is designed to optimize its recovery at the end of its life cycle (to facilitate materials disassembly and separation, modularity for reuse of certain parts, reuse and remanufacturing enhancement, etc.).	537	73	18	7,30	1,61
3	EPR	Some national authorities define an Extended Producer Responsibility scheme or take-back scheme for some furniture products, forcing to define a system for the collection and treatment of these products at the end of their life cycle, being the organisation that put the product on the market the one responsible for covering the associated costs.	534	70	23	7,68	1,79
4	CE	The implementation of the actions proposed in the Circular Economy Package of the EC (COM (2015) 614) will generate changes in the productive models of the furniture sector, developing processes and machinery that are more efficient and generating less waste, based on lean manufacturing principles and new ICT technologies (Industry 4.0).	531	75	16	7,13	1,91
5	CUS	New technologies (e.g. Internet of Things, blockchain, BIM, RFID tags, etc.) are used to improve the traceability of wood products to ensure the chain of custody along the whole value chain and to create Material Passports to facilitate their reusing and recycling.	529	75	14	7,04	1,54
6	GPP	In Europe, it has been achieved the objective that 50% of public procurement tenders for furniture include all environmental criteria of green public procurement set by the European Union or all the ones set by each country. This percentage will be higher than 70%, if we include also those public procurement tenders for furniture that include only some of these environmental criteria.	528	74	17	7,09	1,69
7	CUS	Customers, final customers (B2C) and especially intermediate customers (B2B), demand that the furniture product has a chain of custody certification, according to existing schemes (FSC, PEFC, etc.), which have become a standard.	512	78	16	6,57	1,96
8	FEM	The European Commission decides to regulate the emission of formaldehyde of products at European level, fixing a value lower than category E1 (<0.124 mg/m3) currently fixed in several European countries and in the voluntary agreement of EPF (European Panel Federation) members, bringing harmonization to a fragmented single market.	496	77	17	6,44	1,92
9	ECD	The majority of furniture is designed to extend its life cycle (more resistant materials/joints, facilitate its repair and maintenance, etc.), increasing its quality. The furniture that is not meant to last, will be designed in such a way that is easy to re/upcycle.	494	70	19	7,09	1,84
10	CUS	Customers, final customers (B2C) and especially intermediate customers (B2B), demand that the furniture products use wood from forests with certified management according to certificates such as FSC, PEFC, or others equivalent, which have become a standard.	494	78	16	6,36	1,95
11	REA	The proposal presented within the REACH Regulation framework is approved to restrict the placing on the market or the use of items that emit formaldehyde at concentration levels equal or lower to 0.124 mg/m3 (equivalent to category E1), bringing harmonization to a fragmented single market	494	77	17	6,43	2,06
12	GPP	All European countries have developed Green Public Procurement criteria for furniture, either by adopting the EU recommendations or by developing their own. Only some of them will approve a law based on these criteria, the others will just consider them as recommendations. A European directive to implement green public procurement will be adopted and countries will follow it, but some of them probably won't have it fully transposed by 2030.	490	72	18	6,79	1,56
13	GBC	The criteria associated with the use of furniture that uses sustainable materials acquires greater relevance in the systems of Green building certification (e.g. LEED or BREEAM), encouraging their use in those buildings that aim to obtain this type of certification. This will act as a driver that will encourage the use of these more sustainable materials, also for buildings that don't have these certifications.	489	74	17	6,60	1,77

Class	Instrument	**Forecasted Evolution** Importance = Probability x Impact. Probability: scale 1 - 100. Impact: scale 1 - 10	**Importance**	Probability Mean Value	Probability Standard devation	Impact Mean Value	Impact Standard devation
14	ErP	Ecological design requirements are defined for products not-related with energy, such in the case of furniture sector products, under the eco-design (ErP) directive framework (2009/125/EC). These criteria include aspects of materials efficiency such as durability requirements, reparability, spare parts availability, disassembling easiness, use of materials, source of materials (from previous products, raw material, reused materials), etc. Private sector could exploit this to create new services and opportunities.	489	68	24	7,23	1,63
15	CE	The implementation of the actions proposed in the Circular Economy Package of the EC (COM (2015) 614) will produce changes in the customer service models, increasing the information to be provided to customers (for example: content of hazardous substances, product durability, manuals for repair and maintenance, instructions for the end of life management, etc.).	488	77	19	6,31	2,05
16	CUW	The European Commission reinforces its circular economy strategy by promoting the strategy of cascading use in the wood sector, facilitating the recovery of wood in the different stages of the product, optimising its use according to the wood quality (less contaminated, etc.)	487	70	19	6,96	1,71
17	CE	The furniture sector will be an established priority in the Circular Economy Package of the EC (COM (2015) 614)[1], with specific legislation to increase the reuse and recycling of its products, setting specific objectives of recovery similar to existing EPR schemes.	486	67	17	7,23	1,53
18	REA	The REACH Regulation (EC 1907/2006) classifies some of the substances used in the furniture products manufacturing, such as toxic flame retardants, formaldehyde or VOCs, as restricted substances (Annex XVII), in the list of candidates or as extremely worrying substances (substances of very high concern –SVHC-) that require authorization (Annex XIV).	475	74	20	6,47	1,93
19	EWC	There is a growing market and demand for wood waste that will be used as secondary raw materials in different sectors, ensuring their quality and traceability.	472	74	19	6,40	1,83
20	CE	Wood and wood-based derivatives will be considered a priority raw material in future reviews of the Action Plan in Circular Economy of the European Commission (COM (2015) 614), developing specific legislation in this regard to promote how and where wood is grown, how wood is maintained, as well as its efficient use and recovery in wood and wood-based derivatives.	457	65	15	6,98	1,63
21	CE	Business models of the furniture sector based on servitization are common in certain sectors (e.g. office, student rental, co-workers, young professionals, etc.), where the manufacturer owns the product and offers the use of furniture as a service to consumers for a certain fee, which covers its maintenance, replacement, etc.	453	64	24	7,02	2,24
22	EWC	End-of-life waste criteria are defined for wood waste from the industry (Directive 2008/98/EC), which will produce quality standards for secondary raw materials. This scenario is not foreseen for post-consumer wood waste (contamination, quality guarantees, etc.)	446	68	17	6,59	1,98
23	CUS	More than 70% of the furniture sector products will be made out of CoC certified resources. Big and medium companies and companies with high export rates will have this certification as a standard. Small companies will have difficulties to obtain this certification due to high costs of certification and high administrative efforts for developing, documenting and implementing the system.	441	69	18	6,42	1,77
24	FOR	The activities of greenhouse gas emissions compensation generate a reactivation of forest resources and plantations, making necessary their better management, traceability and monitoring, which will also supply the furniture industry.	440	71	18	6,20	2,05
25	BE	Based on the European Bioeconomy strategy, the European Commission will encourage significant synergies with other sectors of primary production that use and produce biological resources arise, optimizing raw materials consumption and minimizing generation of waste.	431	67	16	6,41	1,73
26	FEM	Consumers would not have the sufficient knowledge to appreciate that a particular product does not emit formaldehyde, thus a specific label of "formaldehyde-free" to inform consumers will not be needed/effective.	428	69	23	6,24	2,27
27	WEE	Some specific products that contain electrical and electronic components are affected by the requirements of the WEEE Directive (2012/19/EU), and therefore, at the end of their life cycle, they require a specific disassembly and treatment.	427	70	22	6,13	2,20
28	FLA	The use of the most toxic and dangerous flame retardants in furniture products is forbidden. Compliance with the flammability requirements set by current legislation will be secured by alternatives, such as material combinations that in themselves are fire safe, new materials, product design, including the use of interliners, with lower risk for people and the environment, and in addition smart fire prevention and education for consumers will be encouraged.	424	70	18	6,09	1,67
29	BE	The European Bioeconomy strategy has identified the furniture sector as a relevant sector to achieve its objectives, setting concrete actions that bind sector companies.	424	67	15	6,32	1,63
30	FBP	The EU furniture sector adopts concrete and binding commitments aligned with the “Forest-based Industries 2050: a vision for sustainable choices in a climate-friendly future” and in particular aligned with the following goals of the vision: i) eradicate waste in circular economy by closing materials loops with a sector target of at least 90% material collection and 70% recycling rate; ii) drive resource-efficiency in the industrial value chain by enhancing productivity in all areas (materials, manufacturing, logistics); iii) meet the increasing demand for raw materials by maximizing new secondary streams and ensuring primary raw materials supply from sustainably managed forests and iv) satisfy the growing demand for climate-friendly products by increasing the use of wood and wood-based products in our daily lives.	419	64	18	6,60	1,40

Class	Instrument	**Forecasted Evolution** Importance = Probability x Impact. Probability: scale 1 - 100. Impact: scale 1 - 10	**Importance**	Probability Mean Value	Probability Standard devation	Impact Mean Value	Impact Standard devation
31	WEE	Some specific furniture sector products that contain electrical and electronic components are affected by the requirements of the WEEE Directive (2012/19 / EU), and guidelines are set for specific disassembly of the electrical and electronic components inside the normal recovery circuit of furniture waste.	415	68	21	6,11	2,05
32	CE	The implementation of the actions proposed in the Circular Economy Package of the EC (COM (2015) 614) will produce changes in the customer service models, increasing the minimum guarantee period and the time of spare parts availability.	401	66	21	6,13	2,07
33	FEM	The European Commission does not propose to reduce the formaldehyde occupational exposure limit below the current value of 0.3 ppm.	399	71	18	5,62	1,73
34	ILL	The type of products covered by the Regulation (EU) No. 995/2010 or EUTR is extended, reducing the number of exclusions and extending the scope to medical furniture and seating furniture (e.g. sofas, chairs, etc.). Market surveillance will be stronger and the traceability of wood from forests to furniture companies will be ensured (through sustainable and traceable chains).	397	68	17	5,82	1,92
35	ROH	Furniture sector products that contain electrical and electronic components are affected by the requirements of the RoHS Directive (EU 2017/2102), and therefore their components cannot contain substances such as brominated flame retardants (PBDE, PBB) or heavy metals such as lead, mercury, cadmium or hexavalent chromium, including components purchased and finished outside the EU.	396	75	20	5,31	2,15
36	FOR	The EU Forest Strategy extends beyond forests and deals with aspects of its value chain, such as how forest resources are used to produce products or services, taking into account regional/local conditions but without specifying requirements that imply compliance.	396	64	21	6,22	1,48
37	ECL	50% of the furniture sector products have at least one type of environmental ecolabel. Ecolabel Type II will be the most common one, but Type I and III will also grow.	383	63	20	6,13	1,55
38	ECL	Customers (final or intermediate customers) will not value ecolabels Type I (according to ISO 14024) in a massive way. Just some of these ecolabels will be widely recognized and clients will consider them important, especially in specific markets and for specific products.	373	62	22	6,07	1,78
39	EMS	Some intermediate customers (B2B), value positively that the furniture products supplier in the sector has a certified environmental management system, either EMAS or ISO-14001, which has become a competitive advantage.	367	64	20	5,72	2,14
40	ECL	Intermediate customers (B2B) positively value that the furniture products have a Type III ecolabel (according to ISO 14025), which has become a competitive advantage. Final customers (B2C) will still have many difficulties to appreciate/understand the value of Type III ecolabel for products.	365	61	21	6,02	2,02
41	FLA	Consumers do not have sufficient knowledge on fire safety to determine whether it would be appreciated that a product does not contain dangerous flame retardants (and a label could have the opposite desired effect, leading the consumer to think that fire safety decreases if no flame retardants are used), thus a specific label of "flame retardant-free" would not be effective/desired.	362	67	23	5,43	2,00
42	EMS	In Europe, 15% of companies of the furniture sector have a certified environmental management system, either EMAS or ISO-14001. The impact on certified companies will be high along the whole value chain.	360	62	24	5,78	2,00
43	ILL	The signature of an agreement, under the umbrella of the FLEGT Regulation (Regulation (EC) No 2173/2005), will be compulsory between countries that want to sell wood / wood products in the EU. A stronger market surveillance will prevent the importation and sale of illegal timber products in the EU.	350	64	18	5,44	1,83
44	ECD	20% of the European furniture sector companies will adopt criteria defined by Ecodesign ISO-14006 management system, but only 5% will reach the certification.	334	55	23	6,07	1,90
45	ECD	Few final customers (B2C) and some intermediate customers (B2B), positively value that the furniture products supplier in the sector has an Eco-design ISO-14006 management system, which has become a competitive advantage in niche markets and public procurement.	333	58	24	5,72	1,82
46	END	In some pilot cases and specific regions, wood furniture and panels waste are used to produce second generation biofuels, which meet the sustainability requirements set out in Directive 2018/2001/EU.	332	58	22	5,74	1,98
47	EPR	Some major manufacturers and distributors of the furniture sector and some municipalities at local level agree to define an Extended Producer Responsibility scheme or take-back scheme, which allows the products collection, return and treatment at the end of their life cycle.	332	55	26	6,06	2,39
48	ECL	The different Type I ecolabels criteria that affect the furniture sector are not unified yet, this is hindering their understanding by customers (for example European label, Blue Angel, Nordic Swan, etc.).	322	56	25	5,71	2,18
49	ECL	The amount of companies with a Type II ecolabel (according to ISO 14021) will increase a lot until 2030. This is a positive first step for this trend, but educated consumers will not give much value to self-declarations.	317	57	21	5,58	1,93

КЪМ ИНДЕКС

Topics Acronyms Code/ Instrument

CUW	*Cascading use of wood*
CUS	*Chain of Custody FSC/PEFC*
CE	*Circular Economy Package of the EC*
ECD	*Ecodesign ISO14006*
ECL	*Ecolabels (Type I, II, III)*
EWC	*End-of-waste criteria*
END	*Energy Directive*
EMS EMAS	*Environmental Management Systems ISO14001/*
EPR	*EPR schemes*
ErP	*ErP Directive*
FOR	*EU industry policy for Forestry*
FLA	*Flame retardants*
FBP	*Forest Based Industries Blueprint*
FEM	*Formaldehyde emissions*
GBC	*Green building certification BREEAM/LEED*
GPP	*Green Public Procurement*
ILL	*Illegal logging and illegal timber trade*
REA	*REACH Regulation*
ROH	*RoHS Directive*
WEE	*WEEE Directive*

We can see the following ones in the graphic first quadrant with higher probability and higher impact (probability > 68; impact > 6,35):

- Chain of custody
- Green Public Procurement
- REACH Regulation
- Cascading use of wood
- Green building certification BREEAM/LEED
- Ecodesign
- End-of-waste criteria
- EPR – Extended Producer Responsibility schemes

We can see the following ones in the graphic second quadrant with lower probability and higher impact (probability < 68; impact > 6,35)

- ErP Directive
- Forest Based Industries Blueprint
- Bioeconomy
- Circular Economy Package of the EC

Концепции и рамка, взети предвид за анализа на промените в професионалните профили

В този раздел представяме рамката и концепциите, които сме използвали, за да приложим анализа на въздействието на прехода към кръгова икономика върху мебелния бранш в ЕС, в рамките на перспективата на двойния преход на сектора. Като основа на анализа, ние използваме рамката на ReSOLVE лостовете, разработени от McKinsey Center и Ellen MacArthur Foundation (Growth Within: A Circular Economy Vision for a Competitive Europe, 2015 bit.ly/2MreFWM) и сме анализирали как различните лостове въздействат върху съществуващите задачи на професионалните профили и върху евентуално създадените нови задачи.

Въз основа на промените в задачите на професионалните профили, ние идентифицирахме развитието на рискове за ЗБТ и нуждите от умения в резултат на прехода на мебелния сектор към по-кръгова икономика. В следващия раздел ние представяме тези промени за всеки от единадесетте профила в различни таблици, които са представени по-долу.

Пълните доклади могат да се прочетат на адрес: circularfurniture-sawyer.eu/downloads/

Обяснение на ReSOLVE лостовете

Тази първа таблица накратко описва лостовете, идентифицирани от McKinsey Center и Ellen MacArthur Foundation като ключови ускорители на прехода към по-кръгова икономика. Тези лостове са леко адаптирани от нас спрямо мебелния сектор.

Таблица 4.- Обяснение на ReSOLVE лостовете, по отношение на мебелния сектор

	Лостове	Кратко описание
Регенериране	Преминаване към възобновяема енергия	Използването основно на възобновяема енергия, например, слънчева, вятърна, включително и био-маса (напр. възможно използване на дървени отпадъци като енергиен източник).
	Преминаване към възобновяеми материали	Използване на базирани на дърво материали от по-устойчиви източници или замяна на други материали (напр. пластмаса, метали или текстилни компоненти) с възобновими алтернативи.
	Възстановяване, запазване и регенериране на здравето на екосистемите	Улесняване на регенерирането на екосистемите, увредени от техните дейности, например насърчаване на устойчиво управление на гори и плантации, регенериране на земя, запазване на био-разнообразието и т.н.
	Връщане на възстановените биологични ресурси в биосферата	Улесняване на връщането на дървените отпадъци в биосферата (напр. връщане на пепелта от изгаряне на дърво като хранителни вещества за горите и др.).

	Лостове	Кратко описание
Споделяне	Понижение на скоростта на замяна на продукти и повишение на използването на продукти чрез тяхното споделяне между различни потребители	Насърчаване на споделяне на продукти, например чрез споделяне на частни продукти или чрез обществено споделяне на набори от продукти.
	Повторна употреба на продукти през техния технически жизнен цикъл	Подпомагане на повторното използване на продукти, например улесняване на процесите на ремонт или преработка (напр. почистване, разглобяване и т.н.) и предоставяне на информация за характеристиките на продуктите (напр. процес на разглобяване, използвани материали и компоненти и др.).
	Удължаване на жизнения цикъл на продуктите чрез поддръжка	Улесняване на поддръжката на продуктите чрез предоставяне на инструкции за поддръжка на потребителите или чрез специализирани услуги (напр. изисквания за поддръжка на покритие, препоръчителни продукти за поддръжка и др.).
	Удължаване на жизнения цикъл на продуктите чрез ремонт	Улесняване на ремонта на продуктите (от потребителя или от специализирани услуги), например, чрез предоставяне на информация за ремонт, резервни части и бързата им доставка на разумни цени, улесняване на разглобяването/сглобяването на продуктите, увеличение на гаранционния период или предоставяне на информация за характеристиките на продуктите (напр. процес на разглобяване, използвани материали и компоненти и др.).
	Удължаване на живота на продуктите чрез тяхното проектиране за дълготрайност	Удължаване на дълготрайността на продуктите чрез дизайн, например чрез използването на по-устойчиви материали и фитинги, избягване на моралното остаряване, прилагане на модулен/адаптивен дизайн и др.
Оптимизиране	Повишение на характеристиките за представяне/ефективност на продуктите	Повишаване на характеристиките на представяне на продуктите, например чрез модулен дизайн, използване на по-малък брой части и материали, предлагане на повече функции и др.
	Персонализиране/ изработка по поръчка	Персонализиране на продуктите според нуждите и изискванията на клиентите или производство по поръчка (напр. партида, размер 1, масово персонализиране).
	Репродуктивно и адаптируемо производство	Надграждане на производствените процеси, така че те да бъдат по-репродуктивни, адаптивни, гъвкави и автономни спрямо изискванията за промени и производствените нужди (промишленост 4.0).
	Минимализиране на отпадъците във веригите за производство и доставка	Понижение на генерирането на отпадъци по целия жизнен цикъл на продуктите, например от опаковки (от доставчици и дистрибутори на продукти), производствени отпадъци и др.
	Повишение на ефективността на производствените процеси	Повишение на ефективността на производствените процеси, например, чрез прилагането на нови 4.0 технологии (напр. роботи, големи данни и др.), по-ефективно оборудване или нови методи (напр. стегнато производство).
Цикличност	Преработка на продукти и/или компоненти	Директна преработка на продукти или части, напр., дефиниране на системи за събиране, въвеждане на процеси за преработка (напр. сортиране и почистване, замяна на компоненти/материали и др.) и дефиниране на механизми за изпитване и валидиране на качество.
	Въвеждане на програми за обратно събиране	Стартиране на програми за обратно събиране на продукти на компанията (напр. места за събиране, реверсивна логистика, процеси за обработка, сценарии за обработка на събраните материали и др.).
	Рециклиране на материали	Повишаване на използването на рециклирани материали (напр. рециклирани материали, базирани на дърво), дефиниране на изисквания за качество и доставка на рециклирани материали, процедури за изпитване, механизъм за удостоверяване на качество и др.
	Насърчаване на каскадната употреба на дърво	Подпомагане на каскадното използване на, например улесняване на рециклирането (съвместимост на материали и др.), избягване на използването на опасни вещества, предоставяне на информация за използвани материали и вещества и др.
	Насърчаване на извличането на био-химикали от органични отпадъци	Насърчаване на анаеробното разграждане или извличане на био-химикали от дървени отпадъци, например, избягване на използване на възможни замърсители, което ще улесни процеса на възстановяване.
Виртуализиране	Виртуализиране на директните аспекти на продукта	Дематериализиране (виртуализиране) на самия продукт, например чрез виртуален дизайн за клиента, симулация на представяне на продукта и т.н.
	Виртуализиране на косвените аспекти на продукта	Дематериализиране (виртуализиране) на косвените аспекти на продукта, например онлайн пазаруване, услуги за виртуална помощ, цифрова информация за продукта за клиента и др.
Замяна	Замяна на стари материали с нови, възстановими такива	Замяна на старите материали с други, нови, възстановими материали, например нови типове ламинати, нови покрития, нови добавки и др.
	Прилагане на нови технологии	Въвеждане и адаптиране на нови 4.0 технологии към продукта и производствените процеси (напр. добавъчно производство, IoT, добавена реалност и др.)
	Избор на нови продукти и услуги	Разработка на нови продукти, услуги и бизнес модели, например сервитизация (продукт като услуга), многофункционален продукт и др.

Ниво на въздействие на законовите, доброволни и политически инструменти върху ReSOLVE лостовете

Следващата таблица представя прогнозното ниво на въздействие на идентифицираните законови, доброволни и политически инструменти върху предложените лостове от рамката ReSOLVE върху кръговата икономика през 2030 г.

0.- Не се предвижда въздействие през 2030 г. за производителите на мебели от дървесина
1.- Предвижда се малко въздействие през 2030 г. за производителите на мебели от дървесина
3.- Предвижда се средно въздействие през 2030 г. за производителите на мебели от дървесина
5.- Предвижда се голямо въздействие през 2030 г. за производителите на мебели от дървесина

По-високите стойности подчертават тези инструменти, които биха имали по-голямо въздействие върху лостовете и кои лостове могат да бъдат засегнати в по-голяма степен от тези инструменти. Тази информация може да се използва от компаниите за правилно определяне на собствената им стратегия за кръговост и напасване спрямо тези инструменти.

Таблица 5.- Ниво на въздействие на законовите, доброволни и политически инструменти върху ReSOLVE лостовете.

		Регенериране			
		Преминаване към възобновяема енергия	Преминаване към възобновяеми материали	Възстановяване, запазване и регенериране на здравето на екосистемите	Връщане на възстановените биологични ресурси в биосферата
Законодателни инструменти	Пакет за кръгова икономика за ЕО	3	5	3	3
	Директива относно отпадъци от електрическо и електронно оборудване (ОЕЕО)	0	0	0	0
	Ограничаване на опасните вещества в електрическо и електронно оборудване (ROHS)	0	0	0	0
	Директива за продукти, свързани с енергия (директива за ErP или за екологичен дизайн)	0	3	1	0
	Удължена отговорност на производителя (EPR програми)	3	3	1	3
	Опасни вещества / REACH регламент	0	3	1	1
	Емисии на формалдехид/летливи органични съединения	0	1	0	0
	Правила на ЕС по отношение на критерии за отпадъци в края на живота на продукти	3	3	1	3
	Забавители на горенето	1	1	0	0
	Директива за възобновяема енергия (RED II)	5	0	0	3
	Незаконна сеч и незаконна търговия с дървесина	0	3	3	0
Доброволни инструменти	Зелени обществени поръчки	1	5	1	0
	Управление на околната среда в организации	3	1	3	3
	Методология на екологичен дизайн	3	5	0	1
	Екологични етикети (Тип I, II и III)	1	3	1	0
	Сертифициране във връзка с верига на проследимост на доставките	0	5	5	1
	Сертифициране на зелени сгради	1	3	1	0
Политики	каскадно използване на дървесина	3	5	1	3
	Промишлена политика на ЕС за лесовъдство	1	3	3	1
	Пътна карта за брашновете, свързани с гори	1	3	1	1
	Био-икономика	1	3	3	1
	Общо	30	58	29	24

	Споделяне					Оптимизиране					Цикличност					Виртуализи-ране		Замяна			Общо
	Понижение на скоростта на замяна на продукти и повишение на използването на продукти чрез тяхното споделяне между различни потребители	Повторна употреба на продукти през техния технически жизнен цикъл	Удължаване на жизнения цикъл на продуктите чрез поддръжка	Удължаване на жизнения цикъл на продуктите чрез ремонт	Удължаване на живота на продуктите чрез тяхното проектиране за дълготрайност	Повишение на характеристиките за представяне/ефективност на продуктите	Персонализиране/изработка по поръчка	Репродуктивно и адаптируемо производство	Минимализиране на отпадъците във веригите за производство и доставка	Повишение на ефективността на производствените процеси	Преработка на продукти и/или компоненти	Въвеждане на програми за обратно събиране	Рециклиране на материали	Насърчаване на каскадно използване на дървесина	Насърчаване на извличането на био-химикали от органични отпадъци	Виртуализиране на директните аспекти на продукта	Виртуализиране на косвените аспекти на продукта	Замяна на стари материали с нови, възобновими такива	Прилагане на нови технологии	Избор на нови продукти и услуги	
	3	5	3	3	5	3	3	3	5	3	3	5	5	3	1	3	3	3	3	5	84
	0	1	0	1	1	1	1	1	3	1	1	3	3	1	0	0	1	1	3	1	24
	0	0	0	0	0	0	1	1	0	0	0	0	3	3	1	0	1	1	1	0	12
	1	3	1	1	3	3	1	1	1	1	3	1	3	3	0	1	3	1	1	1	37
	3	5	3	5	5	3	1	3	5	3	5	5	3	3	1	1	3	3	3	5	78
	0	3	1	1	1	1	3	3	1	3	1	1	3	5	1	1	1	3	3	1	42
	0	1	1	1	1	1	3	3	0	1	0	0	1	3	0	0	1	5	3	0	26
	0	0	0	0	0	1	0	0	5	3	1	1	5	3	3	0	0	1	0	1	34
	1	3	0	1	3	1	3	3	0	1	1	1	3	3	1	1	1	3	3	0	35
	0	0	0	0	0	0	0	0	3	3	0	1	0	1	3	0	0	0	1	1	21
	0	0	0	0	0	0	1	3	1	1	1	1	3	1	0	0	1	1	3	3	26
	3	3	5	5	5	5	3	3	1	3	3	3	5	3	0	3	3	3	3	5	74
	0	0	0	0	1	0	1	3	3	5	1	3	3	1	0	0	3	1	1	1	37
	3	5	3	5	5	3	1	0	1	1	3	1	5	3	1	3	1	3	3	5	64
	1	3	1	3	3	3	3	1	1	3	3	1	5	3	0	1	5	3	3	3	54
	0	0	0	1	0	1	1	3	1	3	1	1	3	3	1	1	3	3	3	3	43
	1	1	1	1	3	3	3	1	1	1	1	1	3	1	0	1	1	1	1	3	34
	3	3	1	1	3	1	1	1	3	3	3	3	5	5	3	1	1	1	3	3	60
	0	0	0	0	0	0	0	1	1	3	1	1	1	1	1	0	0	0	1	1	20
	1	3	1	3	3	1	3	5	1	5	3	1	3	3	0	3	3	3	3	5	59
	1	1	0	0	1	0	0	1	1	1	1	3	3	3	1	0	1	3	3	3	35
	21	40	21	32	43	31	33	40	38	48	36	37	68	55	18	20	36	43	48	50	

▲ КЪМ ИНДЕКС

Класифициране на въздействащите ReSOLVE лостове и законови, доброволни и политически инструменти

Следните две таблици са създадени на база на резултатите от предходния анализ.

Първата таблица показва ReSOLVE лостовете, които са най-силно засегнати от идентифицираните законови, доброволни и

Таблица 6.- Класифициране на въздействието върху ReSOLVE лостове

ReSOLVE лостовете	Оценка
Рециклиране на материали	68
Преминаване към възобновяеми материали	58
Насърчаване на каскадната употреба на дърво	55
Избор на нови продукти и услуги	50
Прилагане на нови технологии	48
Повишение на ефективността на производствените процеси	48
Удължаване на живота на продуктите чрез тяхното проектиране за дълготрайност	43
Замяна на стари материали с нови, възстановими такива	43
Повторна употреба на продукти през техния технически жизнен цикъл	40
Репродуктивно и адаптируемо производство	40
Минимализиране на отпадъците във веригите за производство и доставка	38
Въвеждане на програми за обратно събиране	37
Преработка на продукти и/или компоненти	36
Виртуализиране на косвените аспекти на продукта	36
Персонализиране/изработка по поръчка	33
Удължаване на жизнения цикъл на продуктите чрез ремонт	32
Повишение на характеристиките за представяне/ефективност на продуктите	31
Преминаване към възобновяема енергия	30
Възстановяване, запазване и регенериране на здравето на екосистемите	29
Връщане на възстановените биологични ресурси в биосферата	24
Понижение на скоростта на замяна на продукти и повишение на използването на продукти чрез тяхното споделяне между различни потребители	21
Удължаване на жизнения цикъл на продуктите чрез поддръжка	21
Виртуализиране на директните аспекти на продукта	20
Насърчаване на извличането на био-химикали от органични отпадъци	18

политически инструменти, играещи ключова роля в ускоряването на прехода на мебелния сектор към по-кръгова икономика.

Втората таблица показва класификация на инструментите и политиките, оказващи най-голямо въздействие върху ReSOLVE лостовете.

Таблица 7.- Класиране на въздействието на инструментите и политиките за кръгова икономика

Инструменти	Оценка
Пакет за кръгова икономика за ЕО	84
Удължена отговорност на производителя (EPR програми)	78
Зелени обществени поръчки	74
Методология на екологичен дизайн	64
каскадно използване на дървесина	60
Пътна карта за брашновете, свързани с гори	59
Екологични етикети (Тип I, II и III)	54
Сертифициране във връзка с верига на проследимост на доставките	43
Опасни вещества / REACH регламент	42
Управление на околната среда в организации	37
Директива за продукти, свързани с енергия (директива за ErP или за екологичен дизайн)	37
Забавители на горенето	35
Био-икономика	35
Сертифициране на зелени сгради	34
Правила на ЕС по отношение на критерии за отпадъци в края на живота на продукти	34
Незаконна сеч и незаконна търговия с дървесина	26
Емисии на формалдехид/летливи органични съединения	26
Директива относно отпадъци от електрическо и електронно оборудване (OEEO)	24
Директива за възобновяема енергия (RED II)	21
Промишлена политика на ЕС за лесовъдство	20
Ограничаване на опасните вещества в електрическо и електронно оборудване (ROHS)	12

Рискове и опасности в промишлеността за мебели от дървесина

Дървообработването в мебелната промишленост може да бъде опасно за работниците. От използването на машини и инструменти, работа с тежки материали до излагане на въздействието прах, шум и химикали – по всяко време могат да се случат потенциално вредни събития. Тези събития могат да засегнат здравето на работниците, например да доведат да кожни и респираторни заболявания. Те могат да доведат до наранявания, като загуба на пръсти или дори смърт.

В Таблица 8 ще намерите обзор на различните видове опасности, пред които могат да се изправят работниците от предприятията за производство на мебели от дървесина. Тя е създадена от нашия външен експерт по ЗБТ и се базира на различни източници на информация и техния анализ. В СИН ЦВЯТ са маркирани опасностите, в резултат на цифровизацията на сектора през 2025 г. Освен това, ние маркирахме в ЗЕЛЕН ЦВЯТ новите опасности, дължащи се на прехода към кръгова икономика през 2030 г.

Опасностите, споменати в таблицата, са свързани с мебелната промишленост, предприятия за производство на мебели, и потенциалните нови дейности, които може да се извършват в тези предприятия в резултат на нови производствени процеси и нови бизнес модели, появили се благодарение на кръговата икономика (напр. преработка, ремонт и т.н.).

Имайки предвид, че здравето и безопасността на работното място са част от управлението и са включени при проектирането на екологични продукти (напр. по-лесно разглобяване, съдържание на по-малко опасни вещества и др.), здравето и безопасността в дървообработващия сектор ще се подобрят в резултат на стратегиите на кръговата икономика.

Промените и опасностите, в резултат на дейностите и задачите на рециклиращата промишленост или свързани с нови източници на енергия не попадат в обхвата на този анализ и не са включени. Полевите услуги, като поддръжка и ремонт при клиента също не са част от обхвата на този доклад.

Таблица 8.- Общи и нови рискове и опасности в мебелния сектор.

Различните категории опасности	Подробности за опасностите от всяка категория и кратко описание
Механични опасности	
• Незащитени движещи се части (използване на помощни роботи), (притискане, удряне, премазване, порязване, ампутация, пъхане/захващане). • Части с опасни форми (режещи, остри, абразивни). • Придвижване на транспортни средства и инструменти (удар, преобръщане, падане от височина). • Неконтролируеми движещи се части (летящи предмети, парченца дърво).	Ръчни и електрически инструменти: Риск от убождания, порязвания, ампутации на пръстите от ръчни и електрически инструменти. Преработката и селективното разглобяване може да изисква нови типове инструменти. Незащитени движещи се части: Опасност от увличане на части от тялото от въртящи се части или машини. Части с опасни форми (режещи, остри, абразивни).
• Подхлъзвания и препъвания	Подхлъзвания, препъвания и падания от високо.
• Падане от високо	Рискове от подхлъзвания, препъвания и от хлъзгави повърхности, стълби, препятствия по пътеки, лошо осветление, неподходящи обувки, небезопасно използване на стълби.
• Свързани с ергономията опасности	Рисковете от свързани с ергономията опасности могат да намалеят в зависимост от поемането на определени задачи от помощни роботи/роботи. От друга страна, работниците се излагат все повече на свързани с ергономията опасности, като например липса на движение/липса на активност поради експлоатацията на автономни машини и помощни роботи от компютърни работни станции. Рискът може да бъде понижен за работниците поради по-добрия дизайн на продуктите (екологичен дизайн), вземайки предвид аспекти, като по-лесно сглобяване и разглобяване, по-добър подбор на свързващи системи и др. и ако се вземе предвид безопасната поддръжка на машините от самото начало.
• Тежки товари/тежка, интензивна работа	Опасност от болка от тежки товари и тежка, интензивна работа. Рискът може да бъде понижен за работниците поради използването на роботи/коботи и цифрови машини. Разглобяването на произведени стоки може да доведе до заболявания на мускулно-скелетната система (напр. нетипични позиции, повдигане и носене на тежки предмети).
• Неудобно положение/ небалансирано напрежение	Риск от болка или нараняване от работа в неудобни пози. Рискът може да бъде понижен за работниците поради използването на роботи/коботи и цифрови машини. Дейностите по разглобяване за възстановяване на материали (деструктивни методи) могат да предизвикат допълнителни заболявания на мускулно-скелетната система.
• Повтарящи се движения	Риск от болка и нараняване вследствие на извършване на повтарящи се задачи.
• Липса на опит; липса на активност	Риск от хронична болка във врата и гърба, затлъстяване и сърдечносъдови заболявания в резултат на липса на активност, продължително седене и лоши ергономични практики с мобилни устройства.
Електрически опасности	
• Токов удар	Опасност от удар от електрически ток поради лошо поддържани или счупени машини и електрически кабели.

Различните категории опасности	Подробности за опасностите от всяка категория и кратко описание
• Опасности от физически въздействия/физически агенти	
Опасности от физически въздействия/физически агенти	
• Шум	Излагане на въздействието на шум от машини и инструменти. Възможно използване на по-шумни машини в дейностите по разглобяване и ремонт. Но шумът може да бъде понижен от екологичния дизайн на машините, които работят по-тихо и по-ефективно.
• Вибрации	Опасност от вибрации по дланите и ръцете от вибриращи инструменти или детайли. Възможно използване на допълнителни вибрационни инструменти по време на преработка или ремонт на продукта (полиращи машини и др.). Но вибрациите може да бъдат понижени от екологичния дизайн на машините, които работят с по-малко вибрации и по-ефективно.
• Лазерна светлина	Излагане на въздействието на лазерна светлина от машини за лазерно рязане.
Опасности от пожари и експлозии	
• Запалими вещества	Експлозия: Рискове от експлозия от материали, включително дървесен прах и химикали. Рециклирането на продукти от дървесина създава високо ниво на дървесен прах и фини частици по време на разбиване. Без ефективно извеждане на праха, рискът от експлозия може да се повиши. Разтворители, почистващи продукти и смазочни материали, използвани в дървопреработвателния сектор, може да се базират на по-малко опасни вещества (напр. разтворители) и по този начин да се предотвратят рисковете от пожар.
	Пожар: Опасност от пожар от химикали и дървесен прах. Рециклирането на продукти от дървесина създава високо ниво на дървесен прах и фини частици по време на разбиване. Без ефективно извеждана на праха, рискът от пожар може да се повиши. Разтворители, почистващи продукти и смазочни материали, използвани в дървопреработвателния сектор, може да се базират на по-малко опасни вещества (напр. разтворители) и по този начин да се предотвратят рисковете от пожар.
Опасности от околните работни условия	
Лошо осветление	Опасност от заслепяване или недостатъчна светлина, както и от трептяща светлина.
Климат	Опасност от излагане на въздействието на гореща или студена работна среда, комбинирана с влажност или течения.
Лоша вентилация	Опасност от излагане на въздействието на работна среда с лоша вентилация или липса на свеж въздух.
Опасности от вредни вещества	Рискът може да бъде понижен за работниците като се използват роботи/коботи и цифрови машини при работа с опасни вещества. Производство: Опасностите може да бъдат понижени, ако ЗБУТ бъдат включени в дизайна на продуктите/материалите. Необходимостта от разтворители може да намалее, може да се използват по-малко опасни разтворители, като използването на забавители на горенето, ако бъде одобрено ново свързано с това законодателство или бъдат въведени добри практики. Рециклиране/използване на рециклирани материали: Опасностите може да се увеличат поради липсата на информация за химикалите, съдържащи се в рециклираните продукти и за начините за правилното справяне с тях.
• Прах	Риск от появата на рак от дървесен прах. Риск от алергични респираторни симптоми от дървесен прах. Рециклиране - повишено излагане на прах: излагането на фибри или прах при разглобяване, преработка и ремонт на мебели; прах от рециклирани материали с неизвестен произход може да предизвикат професионална астма (случаи на професионална астма са докладвани във връзка с рециклирането на дърво и хартия).
• Разтворители (невротоксични, алергени)	Рискове от опасни химикали, разтворители и други материали – дерматит, алергични реакции или респираторни проблеми, увреждания на органи. Производство: необходимостта от разтворители може да се понижи, може да се използват по-малко опасни разтворители. Дейностите по ремонт и преработка може да повишат необходимостта от използване на разтворители (почистване на лак, почистване на използвани части).
• Карциногенни вещества	Рискове от появата на рак от химикали (опасни забавители на горенето, най-вече в продукти за тапициране; за довършителни работи на продуктите от дърво се използват лепила и покриващи средства, като разтворители в бои, лепила, глазури, лакове и химикали за отстраняване на бои). Производство: необходимостта от разтворители може да се понижи, може да се използват по-малко опасни разтворители. Рециклиране и използване на рециклирани материали: Рециклираните материали може да съдържат опасни вещества, според най-скорошните проучвания, да бъдат канцерогенни или репро-токсични (в момента са забранени със закон (REACH)).

Различните категории опасности	Подробности за опасностите от всяка категория и кратко описание
• Нови материали (напр. наноматериали)	Риск от излагане на въздействието на наноматериали: съществуват големи пропуски в познанията за рисковете за здравето, свързани с наноматериалите. От друга страна, новите материали може да са по-безопасни заместители на опасните вещества.
• Рециклирани материали	Рециклираните материали може да концентрират в себе си опасни вещества (замърсявания и опаси забавители на горенето, най-вече в продуктите за тапициране) по време на последващо рециклиране и може да променят своя състав, поради различни фактори, като светлина, топлина или стареене на материала неизвестно съдържание и тип на опасни вещества.
Биологични опасности	
• Работа с микроорганизми: Рискове от нецелеви дейности с микроорганизми.	Новите компании, използващи собствените си дървени отпадъци като източник на енергия. Дейностите по преработка и системите за събиране на стари мебели могат да изложат работниците на риск от излагане на микроорганизми, като плесен.
Психосоциални опасности	Работната среда и самото естество на работата оказват важни за здравето и благосъстоянието на работещите влияния.
• Прекомерно работно натоварване	Прекомерното работно натоварване излага работниците на риск от високи нива на дефицит на време и работа на границата на възможностите.
• Ниско удовлетворение от работата	Ниското удовлетворение от работата води до психологически стрес при работниците и може да доведе до нарушения на съня, главоболие и стомашно-чревни проблеми.
• Неясно дефинирани работни задачи	Лошата организация на работата, задачи, които не са ясно дефинирани, могат да изложат работниците на риск от претоварване или липса на достатъчно натоварване, което да доведе до недоволство и стрес.
• Лоша организация на работата	Лошата организация на работата може да изложи работниците на риск от претоварване или липса на достатъчно натоварване, задаване на темпа на работа от машината, високи нива на дефицит на време.
• Лошо проектирана работна среда (вкл. софтуер)	Наличност на недостатъчно оборудване, неговата пригодност или поддръжка; лоши условия на средата, като липса на пространство, лошо осветление, силен шум, излагат работниците на стрес.
• Повтаряща се, монотонна работа	
• Познавателно напрежение	Когнитивните взаимодействия с автономно оборудване и виртуална реалност излагат работниците на стрес. Повишено търсене на компетенции и актуални познания по отношение на развитието на кръговата икономика и рециклиращата индустрия.
• Стрес от продължителни периоди на концентрация и повишено внимание	Продължителен период на концентрация при работа с компютър и нов софтуер и извършване на множество задачи.
• Повишени изисквания за гъвкавост	Повишено изискване за гъвкавост: работниците могат да изпълняват някои задачи от всяко място чрез мобилни устройства. Работниците са изложени на риска да бъдат постоянно на разположение извън работното време. Дейности по преработка и ремонт, работа с рециклирани материали, решения по отношение на кръгова икономика и ориентирани към устойчивост стратегии/продукти/маркетингови проекти и използването на възобновяеми енергийни източници изисква повишена гъвкавост.
• Липса на опит в работата	Новият софтуер и цифровите устройства изискват обучение, някои работници може да нямат достатъчна квалификация и да се чувстват претоварени, без достатъчно опит. Работа с материали, които са произведени преди това: необходимо е придобиването на нови умения за производствения цикъл и веригата за доставки. Ремонтът, преработката и селективното разглобяване изисква нови методи и процедури. Решения по отношение на кръгова икономика и ориентирани към устойчивост стратегии/продукти/маркетингови проекти.
• Липса на участие във вземането на решения, които засягат работника	Работниците, които не усещат, че са уважавани и ценени, се чувстват уязвими и безпомощни.
• Неефективна комуникация, липса на подкрепа от ръководството или колегите	Неефективната комуникация поради лошата работна атмосфера или липсата на колегиалност подлагат работниците на стрес.
• Работа в самота/изолация	Работата в самота, без колеги или само с роботи подлага работниците на стрес и изолация.
• Небалансирано работно натоварване: претоварване/липса на достатъчно натоварване	Небалансираното работно натоварване подлага работниците на стрес.

Poole C.J.M., Basu S., 'Systematic Review: Occupational illness in the waste and recycling sector', Occup Med (Lond), 67(8), p: 626–636, 2017.

Кратко описание на уменията, знанията и компетенциите и зелените генерични компетенции

Дефинициите на следващите концепции са същите, като тези в ESCO (Европейска класификация на уменията/способностите, квалификациите и професиите) и в Европейска квалификационна рамка.

Знания

„Знанията са резултатът от усвояването на информация чрез учене. Знанията са съчетание от факти, принципи, теории и практики, които са свързани със сфера на работа или учене."

Уменията и способностите се основават на факти и теоретични познания, разликата е в начина, по който тези знания се прилагат и се използват.

Умения

„Умение означава способността за прилагане на знания и използване на ноу-хау за изпълнение на задачи и решаване на проблеми". Те могат да бъдат описани като познавателни (включващи използването на логическо, интуитивно и съзидателно мислене) или практически (включващи сръчност и използване на методи, материали, инструменти и уреди).

Способности

„Способност означава доказана възможност и индивидуален капацитет за използване на знания (теоретични и практически), умения и лични, социални и/или методологически способности в реални работни или учебни ситуации и в професионалното и личностното развитие." Те са описани от гледна точка на отговорността и автономността. Поради това по дефиниция способностите са индивидуални, ориентирани към процеса (ориентирани към действие и развитие) и свързани с контекста.

Въпреки че понякога се използват като синоними, термините „умение" и „способност" могат да бъдат разграничени по тяхната сфера. Терминът „умение" обикновено се отнася за използването на методи или инструменти в определени условия и във връзка с определени задачи. Терминът „способност" е с по-широк смисъл и обикновено се отнася до възможността на човек, изправен пред нови ситуации и непредвидени предизвикателства, да използва и прилага знания и умения по независим и самостоятелен начин.

И така:
- **Знания = теоретични, практически, професионални, индустриални …**
- **Умения = познавателни, практически, социални… Умения = познание за това как…**
- **Умения = базирани на задачи, професионални, процедурни, социални, лични … Компетентност = социална и собствена компетентност**

Генерични зелени умения

Генеричните зелени умения включват знания, умения и способности (ЗУС), които са необходими за социалното, икономическото и екологичното развитие на нашия сектор за мебели от дървесина. Благодарение на тези генерични зелени умения, ние можем да дадем своя принос за озеленяване на сектора, като подпомогнем прехода от линейна към кръгова икономика. Поради тази причина е необходимо да развием зелено мислене за минимализиране на въздействията върху околната среда през целия жизнен цикъл на продуктите.

Д-р Маргарита Павлова е класифицирала **генеричните зелени умения в четири категории**, които са необходими за всяка професия, независимо от нивото на умения и които се съчетават с ключови компетентности или меки умения, които са критични за модерната работна сила. Тук, тези зелени умения са контекстуализирани в рамките на перспективата за екологична осъзнатост и разбиране на устойчивото развитие и кръговата икономика.

- **когнитивни компетенции** (1 до 3)
- **междуличностни компетенции** (4 до 9)
- **вътрешноличностни компетенции** (10 и 11)
- **технологични компетенции**(12 до 14)

В това SAWYER проучване, ние използваме тези генерични зелени умения в следния контекст:

- **Екологична осъзнатост и желание за учене**: за устойчиво развитие и кръгова икономика.
- **Системи и умения за анализ на риска** за оценка, интерпретиране и разбиране както на нуждата за промяна от линейна към кръгова икономика, така и специфичните мерки, необходими за този преход.
- **Умения за иновации** за идентифициране на възможности и създаване на нови стратегии за реакция спрямо зелените предизвикателства, свързани с кръговата икономика.
- **Координационни, управленски и бизнес умения** за улесняване на холистичните и интердисциплинарните подходи, включващи икономически, социални и екологични цели в организацията, но също и във веригата на стойност на продукта.
- **Комуникационни умения и умения за преговори** за дискутиране на конфликтни интереси в сложен контекст, свързани с веригата на стойност на продукта.
- **Маркетингови умения** за насърчаване на по-зелени продукти и услуги и комуникиране на предимствата на стратегиите на кръговата икономика.

- **Стратегически и лидерски умения**, които да позволят на създателите на политики и висшия мениджмънт да определят подходящите стимули и да създадат условия, които да позволят по-чисто производство, по-чист транспорт и др. и принципно да насърчават кръговата икономика.
- **Консултантски умения** за предоставяне на съвети на клиентите по отношение на зелени решения и за разпространение на използването на зелени технологии и стратегии за кръгова икономика.
- **Умения за създаване на мрежи, информационни технологии и езикови умения** с цел предоставяне на възможност за присъствие на глобалните пазари и във веригата за стойност на продукта.
- **Умения за адаптиране и преносимост**, които да позволят на работниците да научат и прилагат новите технологии и процеси, необходими за да стане тяхната работа по-зелена и да бъдат приложени стратегиите за кръгова икономика.
- **Предприемачески умения** за улавяне на възможностите, свързани с ниско-въглеродните технологии и кръговите бизнес модели за продукти и услуги.
- **Количествено определяне и наблюдение** на отпадъци, енергия и вода с цел проследяване на индикаторите за представяне на развитие на кръговата икономика.
- Количествено определяне и наблюдение на **използване на материали и въздействие** в зеленото закупуване и подбор,
- **Минимализиране** на използването и въздействието на материали (оценка на въздействието), вземайки предвид целия жизнен цикъл на материала

Ние сме указали дали тези генерични зелени умения имат въздействие (или не) върху целевите ESCO профили и до каква степен.

Технически зелени набори от умения

За някои професионални профили ще бъдат необходими нови зелени умения, тъй като ще има някои нови, специфични задачи, свързани с разглобяване и повторна употреба, повторно производство, рециклиране и творческо повторно приложение. Тези нови набори от умения са особено (по-) важни за „практическите" профили, като мебелист, тапицер или организатори на инструментално оборудване на дървообработващи машини, но и за общи работници, монтажници на мебели и оператори на дървообработващи машини. За тези профили някои от генеричните зелени компетенции, свързани с мениджмънт, маркетинг и комуникация ще бъдат по-малко изразени.

Новите, специфични зелени набори от умения са:

- Разглобяване на базирани на дървесина мебелни продукти.
- Изследване на разглобените елементи за следващи стъпки (повторна употреба, преработка, рециклиране, творческо повторно използване).
- Ремонт на елементи на базирани на дървесина мебели, където е необходимо.

Тези умения идват като „допълващи" съществуващите, необходими КУП за гореописаните професионални профили.

Новите умения ще имат своето въздействие, въпреки че то няма да бъде толкова значително, върху профилите, които управляват и вземат стратегически решения в компаниите. В случая с анализираните ESCO профили, ние имаме предвид мениджърите по продажби и маркетинг, ръководителите на производство, ръководителите на канала за доставки, дизайнерите на мебели.

Професионални профили: текущи и прогнозни промени през 2030 г.

В следващия раздел се разглеждат подробностите на промените, прогнозирани в **мебелния сектор** поради неговия преход към кръгова икономика (в зелено за 2030 г.) и цифровизация (в синьо за 2025 г.): **актуализираните задачи** на целевите професионални профили, **съществуващите и нови рискове в областта на ЗБТ** и **необходимостта от актуализирани умения, знания и способности**. Те са представени чрез специфични таблици, фокусирани върху всеки един от тези аспекти.

В следващите таблици, ние използваме текст в син цвят, за да идентифицираме всички промени в актуалната ситуация, в резултат на цифровизацията на сектора и текст в зелен цвят за промени, в резултат на прехода на сектора към кръгова икономика.

Промени на задачите

Промени на текущите и прогнозираните задачи на всеки от професионалните профили при прехода на сектора към кръгова икономика и цифровизация.
В тези зелени таблици **първата колона** отляво съдържа подробно описание на всеки от профилите на **текущите/актуализираните задачи** (през 2020 г.). Колоните и клетките в средата определят кои задачи са засегнати от различните лостове на ReSOLVE. **Последната колона** в дясно представя **прогноза за промените на задачите** поради цифровизацията на сектора, в син цвят, за 2025 г. и при прехода на сектора към кръгова икономика, в зелен цвят, до 2030 г.

Промени на опасностите и рисковете

Промени на текущите и прогнозираните рискове за всеки от професионалните профили при цифровизацията на сектора.
В тези жълти таблици първите и последните колони са същите като тези в предишните таблици с промените на задачите. Централните клетки показват прогнозата за **ново категоризиране на опасностите**, като в сив цвят са

идентифицирани тези, които не трябва да се променят, в зелен цвят са тези, които са понижени, поради кръговата икономика, в червен цвят са новите или завишени такива поради кръговата икономика, в син цвят са тези, които са понижени поради цифровизацията и жълт цвят са тези, които са повишени поради цифровизацията. След тази таблица, друг раздел разглежда **подробности за промените на актуалните и прогнозираните опасности и рискове** при прехода на сектора към кръгова икономика (в зелен цвят за 2030 г.) и цифровизация (в син цвят за 2025 г.).

Нужди от умения и способности

Прогноза за нужда от ново обучение при прехода на сектора към кръгова икономика (в зелен цвят за 2030 г.) и цифорвизацията на сектора (в син цвят за 2025 г.) за всеки отделен професионален профил.

В тези таблици в лявата колона ще видите списък на **нуждите от настоящи и нови умения, знания и способности**, включително генеричните зелени такива. Втората колона ще ви посочи дали УЗС за всеки от профилите ще бъдат актуализирани (ДА, променен), все още е необходим (ДА или НЕ) нов (НОВ) или неприложим (НП). В последните колони, в дясно, чиито брой и съдържание е различен за всеки профил, се идентифицират **причините за промяна** за всяко от уменията, знанията и способности: зелените точки указват, че промяната е резултат от прехода на сектора към кръгова икономика, а сините точки, че тя е в резултат от цифровизацията на сектора.

Sales and marketing manager ISCO 1221

You will find three different types of tables for each occupational profile, where the forecasted changes due to sector circular economy transition are in green colour and due to sector digitalization are in blue colour.

Tasks changes
Current and forecasted tasks changes.

Hazards and risks changes
Current and forecasted risks changes.

Skills and competences need
Forecast of training new needs.

Sales and marketing manager ISCO 1221

Unfold this to see the current occupational profile description and its tasks and to relate them to the following green table and first yellow table.

Tasks changes

Hazards and risks changes

Hazards and risks comments

Skills and competences needs

КЪМ ИНДЕКС

Sales and marketing manager ISCO 1221

2020
Occupational profile

Current profile description
Sales and marketing managers plan, direct and coordinate the sales and marketing activities of an enterprise or organization, or of enterprises that provide sales and marketing services to other enterprises and organizations.

Current profiles tasks		ReSOLVE levers*																						
		Regenerate	Shift to renewable energies	Shift to renewable materials	Reclaim, retain, and regenerate health of ecosystems	Return recovered biological resources to the biosphere	**Share**	Reduce product replacement speed and increase product utilisation by sharing it among different users	Reuse products throughout their technical lifetime	Prolong products lifetime through maintenance	Prolong products lifetime through repair	Prolong products lifetime through design for durability	**Optimise**	Increase performance/efficiency of products	Customisation/made to order	Reproductible and adaptable manufacturing	Minimize waste in production and supply chain	Increase efficiency of production processes	**Loop**	Remanufacture products and/or components	Implement take-back programs	Recycle materials	Promote the cascade use of wood	Promote extraction of biochemicals from organic waste	
A	Planning and organizing special sales and marketing programmes based on sales records and market assessments.		●	●	●	●		●	●	●	●	●		●	●	●	●	●		●	●	●	●	●	
B	Determining price lists, discount and delivery terms, sales promotion budgets, sales methods, special incentives and campaigns.		●	●					●	●	●	●		●	●	●				●	●	●			
C	Establishing and directing operational and administrative procedures related to sales and marketing activities.																								
D	Leading and managing the activities of sales and marketing staff.													●	●	●				●	●				
E	Planning and directing daily (sales and marketing) operations.																								
F	Establishing and managing budgets and controlling expenditure to ensure the efficient use of resources.																								
G	Overseeing the selection, training and performance of staff.			●				●	●	●	●	●					●				●	●	●		
H	Representing the enterprise or organization at sales and marketing conventions, trade exhibitions and other forums.		●	●	●				●	●	●	●		●	●	●	●	●		●	●	●	●		

*McKinsey center and Ellen MacArthur Foundation

Tasks changes

Current and forecasted tasks changes due to sector circular economy transition (in green for 2030) and digitalization (in blue for 2025) for the occupational profile: Sales and marketing manager - ISCO 1221

2025/30
Occupational profile

Description forecast of the occupational profile in 2030
Sales and marketing managers plan, direct and coordinate the sales and marketing activities of highly digitized and circular economy-oriented enterprises or organizations, or of enterprises that provide sales and marketing services to other digitized and circular economy-oriented enterprises and organizations. Use digitization tools and circular economy-oriented strategies to work in a customer-oriented manner.

	Virtualise	Virtualise direct aspects of the product	Virtualise indirect aspects of the product	**Exchange**	Replace old materials with advanced renewable ones	Apply new technologies	Choose new products and services		**Profile tasks forecast**
		●	●		●	●	●	A	Planning and organizing special sales and marketing programmes based on connected customers ecosystem, sales records, and global digitized market assessments and considering the circular economy-oriented strategies of the organisation and its customers.
		●	●				●	B	Determining price lists, discount and delivery terms, sales promotion budgets, sales methods, special incentives and campaigns using digitized inputs from customer ecosystems, including customers' sustainability needs and requirements on products and services, and a globally connected distribution and marketing network.
		●	●				●	C	Establishing and directing digitized operational and administrative procedures related to sales and marketing activities, aligned with the organisation's strategies and customers demands on sustainability.
		●	●				●	D	Leading and managing the activities of sales and marketing staff in highly digitized and circular economy-oriented organizations, motivating and engaging the staff on organisation sustainability strategies.
		●	●				●	E	Planning and directing daily (sales and marketing) operations within a highly digitized entreprise-customer ecosystem and alligned with the circular economy-oriented strategies of the customers and the organisation.
		●	●				●	F	Establishing and managing budgets and controlling expenditure to ensure the efficient use of resources in a fully connected and digitized system, meeting the customers' expectations on sustainability (and other issues).
		●	●			●	●	G	Overseeing the selection, training and performance of staff exploiting tools and instruments of an highly connected and digitized company, promoting circular economy competences and skills.
		●	●		●	●	●	H	Representing the enterprise or organization at sales and marketing conventions, trade exhibitions, in online platforms and other face-to-face or virtual forums, communicating the circular economy-oriented strategies of the organisation and other sustainability aspects of the products and services.

КЪМ ИНДЕКС

Sales and marketing manager ISCO 1221

2020
Occupational profile

Current profile description
Sales and marketing managers plan, direct and coordinate the sales and marketing activities of an enterprise or organization, or of enterprises that provide sales and marketing services to other enterprises and organizations.

New categorization of hazards

Current profiles tasks		**Mechanical hazards**	Unprotected moving parts[1]	Parts with hazardous shapes (cutting, pointed, rough)	Moving means of transport and tools[2]	Uncontrolled moving parts (flying objects, wood chips)	Slip and trips	Falls from height	**Ergonomic hazards**	Heavy loads/heavy dynamic work	Awkward position/unbalanced strain	Repetitive movements	Lack of exercise, inactivity	**Electrical hazards**	Electric shock	**Hazards due to physical effects/physical agents**	Noise	Vibration	Laserlight	**Fire and explosion hazards**	Flammable substances	**Work environment hazards**	Poor lighting conditions	Climate	Poor ventilation	**Hazards through dangerous substances**	Dust	Solvents (neurotoxic, allergens)	Carcinogens	New materials (e.g. Nanomaterials)	Recycled material	**Biological Hazards**	Non-targeted activities with microorganism	**Psychosocial hazards**	Excessive workloads	Low job satisfaction	Work tasks not clearly defined
A	Planning and organizing special sales and marketing programmes based on sales records and market assessments.												●		●								●	●											●		●
B	Determining price lists, discount and delivery terms, sales promotion budgets, sales methods, special incentives and campaigns.												●		●								●	●											●		●
C	Establishing and directing operational and administrative procedures related to sales and marketing activities.												●		●								●	●											●		●
D	Leading and managing the activities of sales and marketing staff.												●		●								●	●											●		●
E	Planning and directing daily (sales and marketing) operations.												●		●								●	●											●		●
F	Establishing and managing budgets and controlling expenditure to ensure the efficient use of resources.												●		●								●	●											●		●
G	Overseeing the selection, training and performance of staff.												●		●								●	●											●		●
H	Representing the enterprise or organization at sales and marketing conventions, trade exhibitions and other forums.						●						●										●	●											●		●

● No changes ● Reduced due to Circular Economy ● New or increased due to Circular Economy ● Reduced due to digitalization ● New or increased due to digitalization

Hazards and risks changes

Current and forecasted tasks changes due to sector circular economy transition (in green for 2030) and digitalization (in blue for 2025) for the occupational profile: Sales and marketing manager - ISCO 1221

2025/30

Occupational profile

Description forecast of the occupational profile in 2030

Sales and marketing managers plan, direct and coordinate the sales and marketing activities of highly digitized and circular economy-oriented enterprises or organizations, or of enterprises that provide sales and marketing services to other digitized and circular economy-oriented enterprises and organizations. Use digitization tools and circular economy-oriented strategies to work in a customer-oriented manner.

	Poor organisation of work	Poorly designed workplace environment (incl. software)	Repetitive, monotonous work	Cognitive strain	Stress due to long period concentration and awareness	Increased demands on flexibility	Lack of work experience	Lack of involvement in making decisions that affect the worker	Ineffective communication, lack of support from management or colleagues	Working alone/isolation	Workload: overload/underload	Profile tasks forecast
A	●	●		●	●	●	●		●	●	●	Planning and organizing special sales and marketing programmes based on connected customers ecosystem, sales records, and global digitized market assessments and considering the circular economy-oriented strategies of the organisation and its customers.
B	●	●		●	●	●	●		●	●	●	Determining price lists, discount and delivery terms, sales promotion budgets, sales methods, special incentives and campaigns using digitized inputs from customer ecosystems, including customers' sustainability needs and requirements on products and services, and a globally connected distribution and marketing network.
C	●	●		●	●	●	●		●	●	●	Establishing and directing digitized operational and administrative procedures related to sales and marketing activities, aligned with the organisation's strategies and customers demands on sustainability.
D	●	●		●	●	●	●		●		●	Leading and managing the activities of sales and marketing staff in highly digitized and circular economy-oriented organizations, motivating and engaging the staff on organisation sustainability strategies.
E	●	●		●	●	●	●		●	●	●	Planning and directing daily (sales and marketing) operations within a highly digitized entreprise-customer ecosystem and alligned with the circular economy-oriented strategies of the customers and the organisation.
F	●	●		●	●	●	●		●	●	●	Establishing and managing budgets and controlling expenditure to ensure the efficient use of resources in a fully connected and digitized system, meeting the customers' expectations on sustainability (and other issues).
G	●	●		●	●	●	●		●		●	Overseeing the selection, training and performance of staff exploiting tools and instruments of an highly connected and digitized company, promoting circular economy competences and skills.
H	●	●		●	●	●	●		●		●	Representing the enterprise or organization at sales and marketing conventions, trade exhibitions, in online platforms and other face-to-face or virtual forums, communicating the circular economy-oriented strategies of the organisation and other sustainability aspects of the products and services.

1 Cobotics (Squeezing, bumping, crushing, cutting, amputation, drawing-in/trapping).
2 Run over, roll over, falls from height.

КЪМ ИНДЕКС

Hazards and risks changes

Current and forecasted risks changes due to sector circular economy transition (in green for 2030) and digitalization (in blue for 2025) for the occupational profile: Sales and marketing manager - ISCO 1221

2020 Current situation	2025-30 Situation forecast
Work system/work area: office work, business trips, visits to trade fairs, contact with business partners and clients.	Work system/work area: office work, business trips, visits to trade fairs, contact with business partners and clients. Use of innovative software and tools. Taking into account sustainable products and production lines, circular-economy and renewable energy.
Mechanical hazards	
• Slips and trips, obstacles, table edges, moving vehicles, machines. **Effects:** squeezing, cutting, twisting, spraining, bumps and bruises.	• Slips and trips, obstacles, table edges, moving vehicles, machines. **Effects**: squeezing, cutting, twisting, spraining, bumps and bruises.
Ergonomic hazards	
• Ergonomic hazards: from poor ergonomic conditions and inactivity. **Effects**: musculoskeletal diseases, overweight, cardiovascular problems.	• Ergonomic hazards: from poor ergonomic conditions and inactivity. Digitalization will put workers more at risk of being exposed to ergonomic hazards such as lack of exercise/inactivity because of operating autonomous equipment from their office, participating in virtual conferences and online platforms. **Effects**: musculoskeletal diseases, overweight, cardiovascular problems.
Electrical hazards	
• Electrical hazards: contacts with live parts, defective cables (Computer and other electric devices). **Effect**: fatal accident.	• Electrical hazards: contacts with live parts, defective cables (Computer and other electric devices). **Effect**: fatal accident.
Work environmental hazards	
• Work environmental hazards: software not appropriate, poor lighting and inappropriate indoor air quality and temperature. **Effects**: eyestrain, headache, colds, cardiovascular problems.	• Work environmental hazards: software not appropriate, poor lighting and inappropriate indoor air quality and temperature. **Effects**: eyestrain, headache, colds, cardiovascular problems.
Psychosocial hazards	
• Organisation of work/content of work: tight deadlines, performance pressure, high responsibility, overload, lack of training and information.	• Organisation of work/content of work: tight deadlines, performance pressure, high responsibility, overload, lack of training and information, increased demand on flexibility. Excessive workload: involved in the implementation/transition of industrial production towards circular economy.
	• Lack of work experience: new software and digital devices require training, some workers may not have enough competences and may feel overloaded, not experienced enough. Deciding on circular economic and sustainable oriented strategies/products/marketing projects: increased demand on skills and knowledge/keeping up-to-date regarding the current development in circular economy and sustainable oriented strategies/products/marketing projects (staying up-to-date; further training for new technologies and processes).
• Social relationship: difficult clients, difficult colleagues.	• Social relationship: difficult clients, difficult colleagues, lack of social contacts.
• Working method: Frequent contacts with customers, cooperation with other departments. Use of simple software and CRM. **Effects**: stress, burnout and emotional distress, suffering from depression, cardiovascular problems, sleep disorders.	• Working method: Frequent contacts with customers, growing cooperation with other departments. Use of innovative software, digital equipment, cognitive interactions with autonomous machines and virtual reality, virtual conferences. Long period of concentration to work with computer and new software and performing multitasking. Increased demand on flexibility as workers/managers may work from everywhere with mobile devices. Managers/workers are also at risk of being permanent available outside working hours, this will increase with digitalization. Increased demand on flexibility: need of knowledge concerning recycling, sustainable materials and products. **Effects**: stress, burnout and emotional distress, suffering from depression, cardiovascular problems, sleep disorders, cognitive strain, stress due to long period of concentration and information overload.

Skills and competences needs

Forecast of training new needs due to sector circular economy transition (in green for 2030) and digitalization (in blue for 2025) for the occupational profile: Sales and marketing manager - ISCO 1221

Skills, knowledge and competences	Will it continue to be needed?	Main causes/reasons of change: Virtualise direct aspects of the product	Virtualise indirect aspects of the product	Choose new products and services	Use digitization tools to work in a customer-oriented manner	Using digitalized input from customer ecosystems and a globally connected distribution and marketing network	Working within a highly digitalized enterprise-customer ecosystem	Working in a fully connected and digitalized system
Essential skills and competences								
Align efforts towards business development	YES, changed	●	●	●		●	●	●
Build business relationships	YES, changed	●	●		●	●	●	
Develop professional network	YES, changed			●		●		●
Implement marketing strategies	YES, changed	●	●	●	●	●	●	●
Integrate new products in manufacturing	YES, changed			●		●	●	
Manage contracts	YES							
Manage sales channels	YES, changed	●	●			●		●
Manage sales teams	YES							
Use analytics for commercial purposes	YES, changed				●	●		●
Essential knowledge								
Commercial law	YES							
Customer relationship management	YES, changed	●	●	●	●	●	●	
Product comprehension	YES, changed	●	●					
Project management	YES							
Risk management	YES, changed			●		●		●
Generic green skills, knowledge and competences (*)								
Environmental awareness and willingness to learn	NEW			●				
Systems and risk analysis skills	NEW			●				
Innovation skills	NEW			●				
Coordination, management and business skills	NEW			●				
Communication and negotiation skills	NEW	●	●	●				
Marketing skills	NEW	●	●	●				
Strategic and leadership skills	NA							
Consulting skills	NEW	●	●	●				
Networking, information technology and language skills	NEW	●	●	●				
Adaptability and transferability skills	NEW	●	●	●				
Entrepreneurial skills	NEW			●				
Waste, energy and water quantification and monitoring	NA							
Material use and impact quantification and monitoring	NEW		●					
Material use and impact minimisation	NA							

(*) Source: Strietskallina et al. and Dr. Margarita Pavlova

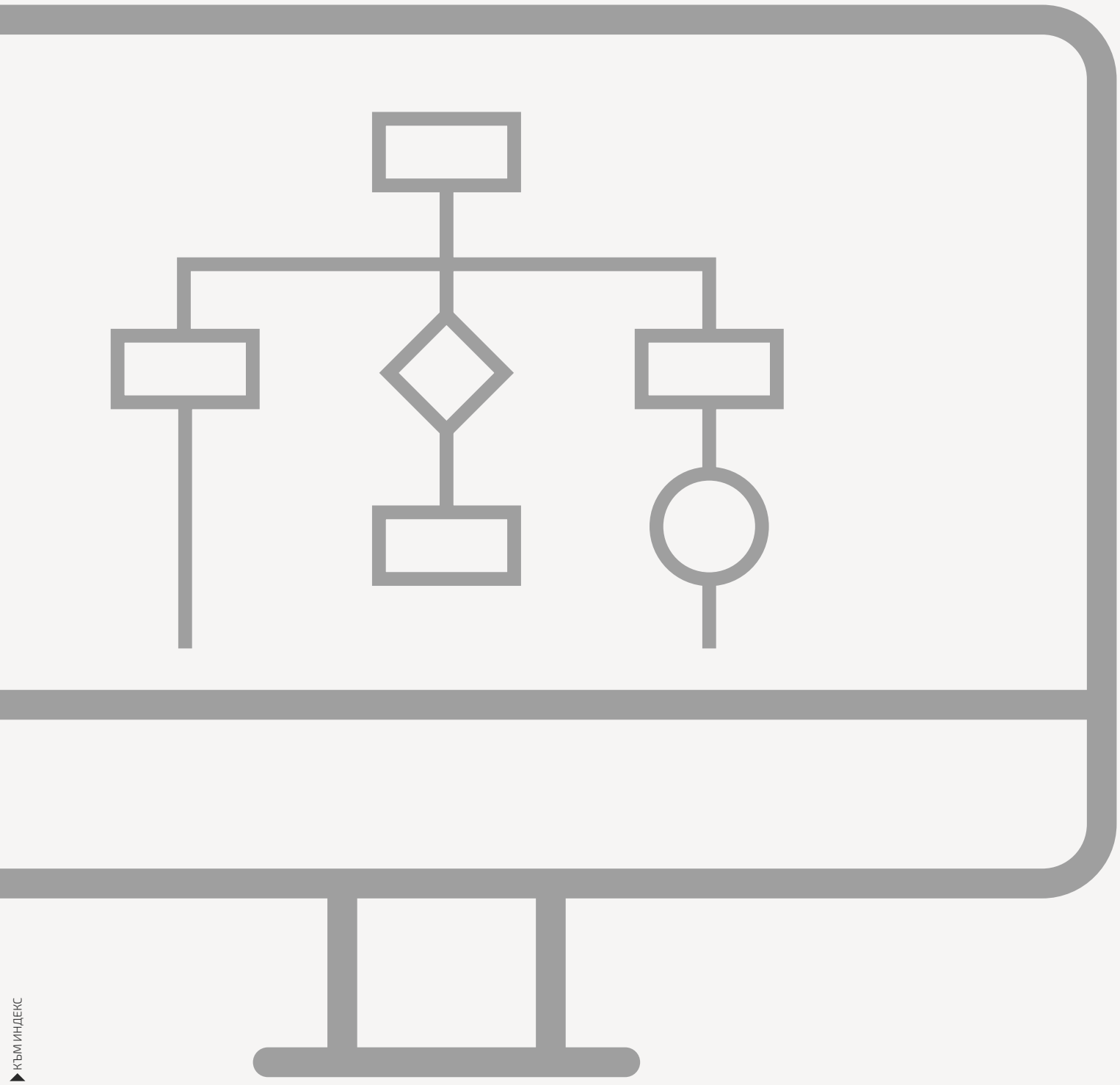
Industrial production manager ISCO 1321s

You will find three different types of tables for each occupational profile, where the forecasted changes due to sector circular economy transition are in green colour and due to sector digitalization are in blue colour.

Tasks changes
Current and forecasted tasks changes.

Hazards and risks changes
Current and forecasted risks changes.

Skills and competences need
Forecast of training new needs.



Industrial production manager ISCO 1321s

Unfold this to see the current occupational profile description and its tasks and to relate them to the following green table and first yellow table.

Tasks changes

Hazards and risks changes

Hazards and risks comments

Skills and competences needs

КЪМ ИНДЕКС

Industrial production manager ISCO 1321s

2020
Occupational profile

Current profile description
Industrial production managers oversee the operations and the resources needed in industrial plants and manufacturing sites for a smooth running of the operations. They prepare the production schedule by combining the requirements of clients with the resources of the production plant. They organise the journey of incoming raw materials or semi finished products in the plant until a final product is delivered by coordinating inventories, warehouses, distribution, and support activities.

Current profiles tasks	**ReSOLVE levers***	**Regenerate**	Shift to renewable energies	Shift to renewable materials	Reclaim, retain, and regenerate health of ecosystems	Return recovered biological resources to the biosphere	**Share**	Reduce product replacement speed and increase product utilisation by sharing it among different users	Reuse products throughout their technical lifetime	Prolong products lifetime through maintenance	Prolong products lifetime through repair	Prolong products lifetime through design for durability	**Optimise**	Increase performance/efficiency of products	Customisation/made to order	Reproductible and adaptable manufacturing	Minimize waste in production and supply chain	Increase efficiency of production processes	**Loop**	Remanufacture products and/or components	Implement take-back programs	Recycle materials	Promote the cascade use of wood	Promote extraction of biochemicals from organic waste	
A	Determining, implementing and monitoring production strategies, policies and plans.		●	●		●		●	●	●	●	●		●	●	●	●	●		●	●	●	●		
B	Planning details of production activities in terms of output quality and quantity, cost, time available and labour requirements.		●	●										●	●	●	●	●		●		●	●		
C	Controlling the operation of production plant and quality procedures through planning of maintenance, designation of operating hours and supply of parts and tools.		●	●										●	●	●	●	●		●		●			
D	Establishing and managing budgets, monitoring production output and costs, and adjusting processes and resources to minimize costs.		●	●										●	●	●	●	●				●			
E	Consulting with and informing other managers about production matters.		●	●										●	●	●	●	●		●	●	●	●		
F	Overseeing the acquisition and installation of new plant and equipment.		●	●		●					●			●	●	●	●	●		●	●	●	●		
G	Controlling the preparation of production records and reports.		●	●										●	●	●	●	●		●		●			
H	Coordinating the implementation of occupational health and safety requirements.		●	●										●	●	●	●	●		●	●				
I	Identifying business opportunities and determining products to be manufactured.		●	●		●			●		●	●		●	●	●	●	●		●	●	●	●		
J	Researching and implementing regulatory and statutory requirements affecting manufacturing operations and the environment.		●	●		●			●	●	●	●		●	●	●	●	●		●		●			
K	Overseeing the provision of quotations for the manufacture of specialized goods and establishing contracts with customers and suppliers.		●	●		●			●			●		●	●	●	●	●		●	●	●	●		
L	Overseeing the selection, training and performance of staff.		●	●				●	●	●	●	●		●	●	●	●	●		●	●	●	●		

*McKinsey center and Ellen MacArthur Foundation

Tasks changes

Current and forecasted tasks changes due to sector circular economy transition (in green for 2030) and digitalization (in blue for 2025) for the occupational profile: Industrial production manager - ISCO 1321s

2025/30

Occupational profile

Description forecast of the occupational profile in 2030

Industrial production managers oversee the operations and the resources needed in highly digitised and ecoefficient industrial plants and manufacturing sites for a smooth running of the operations. Supported by data and instruments of highly digitized systems and following circular economy-oriented strategies, they prepare the production schedule by combining the technical & sustainability requirements of clients with the resources of the production plant. They organise the journey of incoming raw materials or semi finished products in the plant until a final product is delivered by coordinating inventories, warehouses, distribution, and support activities. Use digitization tools and circular economy-oriented strategies to work in a customer-oriented manner.

	Virtualise	Virtualise direct aspects of the product	Virtualise indirect aspects of the product	**Exchange**	Replace old materials with advanced renewable ones	Apply new technologies	Choose new products and services	**Profile tasks forecast**
A		●	●		●	●	●	Determining, implementing and monitoring production strategies, policies and plans exploiting the possibilities of a highly digitised manufacturing plant and considering the circular economy-oriented strategies of the organisation.
B		●			●	●		Planning details of a highly digitized and connected set of production activities in terms of output, quality and quantity, cost, time available and labour requirements and in terms of reducing their environmental impact and the application of circular economy opportunities, such as waste reduction.
C		●				●		Controlling the operation of a highly digitised, lean and ecoefficient production plant including handling of quality procedures and sustainability work practices & policies through planning of maintenance, designation of operating hours and supply of parts and tools.
D						●		Establishing and managing budgets, monitoring production output and costs, and adjusting processes and resources to minimize costs and environmental impacts in a highly connected digital manufacturing chain which applies sustainable technologies and practices.
E		●	●		●	●	●	Securing distribution of information of all production matters to other managers as part of digital performance and sustainability-oriented management as well as consultations with other managers in general and the sustainability manager in specific.
F		●	●		●	●	●	Overseeing the acquisition and installation of highly digitised and ecoefficient new plants and equipment, following the sustainability strategies of the organisation and green procurement criteria.
G		●			●	●		Securing the preparation of fully integrated and digitised production records and reports, including sustainability performance indicators associated to the manufacturing plant.
H		●			●	●	●	Coordinating the implementation of occupational health and safety requirements and other environmental requirements such as hazardous substances use, as part of the highly integrated digital enterprise ecosystem.
I		●	●		●	●	●	Identifying business opportunities and circular economy business models and determining smart (digital) and eco-designed products to be manufactured in an extremely digitised and low environmental impact manufacturing ecosystem.
J					●	●		Researching and implementing regulatory and statutory requirements affecting highly digitised manufacturing operations, the environment and the general company ecosystem, including environmental regulations on products and processes.
K		●	●		●	●	●	Exploiting data and instruments of a highly digitized system, overseeing the provision of quotations for the digitized manufacture of specialized goods and establishing contracts with customers and suppliers, taking into account green procurement criteria and boosting the traction of the supply chain on sustainability.
L		●	●		●	●	●	Overseeing the selection, training and performance of staff exploiting tools and instruments of an highly connected and digitized company, promoting circular economy-oriented competences and skills.

КЪМ ИНДЕКС

Industrial production manager ISCO 1321s

2020
Occupational profile

Current profile description
Industrial production managers oversee the operations and the resources needed in industrial plants and manufacturing sites for a smooth running of the operations. They prepare the production schedule by combining the requirements of clients with the resources of the production plant. They organise the journey of incoming raw materials or semi finished products in the plant until a final product is delivered by coordinating inventories, warehouses, distribution, and support activities.

New categorization of hazards

Current profiles tasks		**Mechanical hazards**	Unprotected moving parts[1]	Parts with hazardous shapes (cutting, pointed, rough)	Moving means of transport and tools[2]	Uncontrolled moving parts (flying objects, wood chips)	Slip and trips	Falls from height	**Ergonomic hazards**	Heavy loads/heavy dynamic work	Awkward position/unbalanced strain	Repetitive movements	Lack of exercise, inactivity	**Electrical hazards**	Electric shock	**Hazards due to physical effects/physical agents**	Noise	Vibration	Laserlight	**Fire and explosion hazards**	Flammable substances	**Work environment hazards**	Poor lighting conditions	Climate	Poor ventilation	**Hazards through dangerous substances**	Dust	Solvents (neurotoxic, allergens)	Carcinogens	New materials (e.g. Nanomaterials)	Recycled material	**Biological Hazards**	Non-targeted activities with microorganism	**Psychosocial hazards**	Excessive workloads	Low job satisfaction	Work tasks not clearly defined
A	Determining, implementing and monitoring production strategies, policies and plans.												●		○								○	○										○		○
B	Planning details of production activities in terms of output quality and quantity, cost, time available and labour requirements.												●		○								○	○										○		○
C	Controlling the operation of production plant and quality procedures through planning of maintenance, designation of operating hours and supply of parts and tools.												●		○								○	○										○		○
D	Establishing and managing budgets, monitoring production output and costs, and adjusting processes and resources to minimize costs.												●		○								○	○										○		○
E	Consulting with and informing other managers about production matters.												●										○	○										○		○
F	Overseeing the acquisition and installation of new plant and equipment.														○								○	○										○		○
G	Controlling the preparation of production records and reports.												●		○								○	○										○		○
H	Coordinating the implementation of occupational health and safety requirements.												●		○								○	○										○		○
I	Identifying business opportunities and determining products to be manufactured.												●		○								○	○										○		○
J	Researching and implementing regulatory and statutory requirements affecting manufacturing operations and the environment.												●		○								○	○										○		○
K	Overseeing the provision of quotations for the manufacture of specialized goods and establishing contracts with customers and suppliers.												●		○								○	○										○		○
L	Overseeing the selection, training and performance of staff.												●		○								○	○										○		○

○ No changes ● Reduced due to Circular Economy ● New or increased due to Circular Economy ● Reduced due to digitalization ● New or increased due to digitalization

Hazards and risks changes

Current and forecasted tasks changes due to sector circular economy transition (in green for 2030) and digitalization (in blue for 2025) for the occupational profile: Industrial production manager - ISCO 1321s

	Poor organisation of work	Poorly designed workplace environment (incl. software)	Repetitive, monotonous work	Cognitive strain	Stress due to long period concentration and awareness	Increased demands on flexibility	Lack of work experience	Lack of involvement in making decisions that affect the worker	Ineffective communication, lack of support from management or colleagues	Working alone/isolation	Workload: overload/underload	Profile tasks forecast
A	●	●		●	●	●	●		●	●	●	Determining, implementing and monitoring production strategies, policies and plans exploiting the possibilities of a highly digitised manufacturing plant and considering the circular economy-oriented strategies of the organisation.
B	●	●		●	●	●	●		●	●	●	Planning details of a highly digitized and connected set of production activities in terms of output, quality and quantity, cost, time available and labour requirements and in terms of reducing their environmental impact and the application of circular economy opportunities, such as waste reduction.
C	●	●		●	●	●	●		●	●	●	Controlling the operation of a highly digitised, lean and ecoefficient production plant including handling of quality procedures and sustainability work practices & policies through planning of maintenance, designation of operating hours and supply of parts and tools.
D	●	●		●	●	●	●		●	●	●	Establishing and managing budgets, monitoring production output and costs, and adjusting processes and resources to minimize costs and environmental impacts in a highly connected digital manufacturing chain which applies sustainable technologies and practices.
E	●	●		●	●	●	●		●		●	Securing distribution of information of all production matters to other managers as part of digital performance and sustainability-oriented management as well as consultations with other managers in general and the sustainability manager in specific.
F	●	●		●	●	●	●		●		●	Overseeing the acquisition and installation of highly digitised and ecoefficient new plants and equipment, following the sustainability strategies of the organisation and green procurement criteria.
G	●	●		●	●	●	●		●	●	●	Securing the preparation of fully integrated and digitised production records and reports, including sustainability performance indicators associated to the manufacturing plant.
H	●	●		●	●	●	●		●	●	●	Coordinating the implementation of occupational health and safety requirements and other environmental requirements such as hazardous substances use, as part of the highly integrated digital enterprise ecosystem.
I	●	●		●	●	●	●		●	●	●	Identifying business opportunities and circular economy business models and determining smart (digital) and eco-designed products to be manufactured in an extremely digitised and low environmental impact manufacturing ecosystem.
J	●	●		●	●	●	●		●	●	●	Researching and implementing regulatory and statutory requirements affecting highly digitised manufacturing operations, the environment and the general company ecosystem, including environmental regulations on products and processes.
K	●	●		●	●	●	●		●		●	Exploiting data and instruments of a highly digitized system, overseeing the provision of quotations for the digitized manufacture of specialized goods and establishing contracts with customers and suppliers, taking into account green procurement criteria and boosting the traction of the supply chain on sustainability.
L	●	●		●	●	●	●		●	●	●	Overseeing the selection, training and performance of staff exploiting tools and instruments of an highly connected and digitized company, promoting circular economy-oriented competences and skills.

2025/30

Occupational profile

Description forecast of the occupational profile in 2030

Industrial production managers oversee the operations and the resources needed in highly digitised and ecoefficient industrial plants and manufacturing sites for a smooth running of the operations. Supported by data and instruments of highly digitized systems and following circular economy-oriented strategies, they prepare the production schedule by combining the technical & sustainability requirements of clients with the resources of the production plant. They organise the journey of incoming raw materials or semi finished products in the plant until a final product is delivered by coordinating inventories, warehouses, distribution, and support activities. Use digitization tools and circular economy-oriented strategies to work in a customer-oriented manner.

1 Cobotics (Squeezing, bumping, crushing, cutting, amputation, drawing-in/trapping).
2 Run over, roll over, falls from height.

Hazards and risks changes

Current and forecasted risks changes due to sector circular economy transition (in green for 2030) and digitalization (in blue for 2025) for the occupational profile: Industrial production manager - ISCO 1321s

2020 Current situation	2025-30 Situation forecast
Work system/work area: office work, use of software, inspection of production facilities and machines, contact with clients.	Work system/work area: office work, use of software, inspection of production facilities and machines, contact with clients, use of digitalized equipment and systems; implementation of industrial production towards circular-economy and use of renewable energy; being in charge of new production lines such as recycling, disassembling, and repair of furniture.
Mechanical hazards	
• Slips and trips, obstacles, table edge, Safety hazards/accidents due to unknown workplaces, travelling and setting up stands.	• Slips and trips, obstacles, table edge, Safety hazards/accidents due to unknown workplaces, travelling and setting up stands.
Effects: squeezing, cutting, twisting, spraining, bumps and bruises.	**Effects:** squeezing, cutting, twisting, spraining, bumps and bruises.
Ergonomic hazards	
• Ergonomic hazards: from poor ergonomic conditions and inactivity.	• Ergonomic hazards: from poor ergonomic conditions and inactivity. Digitalization put workers at risk of being exposed to ergonomic hazards such as lack of exercise/inactivity because of operating autonomous machines from their office, participating in virtual conferences and online platforms.
Effects: musculoskeletal diseases, overweight, cardiovascular problems.	**Effects**: musculoskeletal diseases, overweight, cardiovascular problems.
Electrical hazards	
• Electrical hazards: contacts with live parts, defective cables (computer and other electric devices).	• Electrical hazards: contacts with live parts, defective cables (computer and other electric devices).
Effect: fatal accident.	**Effect**: fatal accident.
Work environmental hazards	
• Work environmental hazards: software not appropriate, poor lighting and inappropriate indoor air quality and temperature.	• Work environmental hazards: software not appropriate, poor lighting and inappropriate indoor air quality and temperature.
Effects: eyestrain, headache, colds, cardiovascular problems.	**Effects**: eyestrain, headache, colds, cardiovascular problems.
Psychosocial hazards	
• Organisation of work/content of work: tight deadlines, performance pressure, high responsibility, overload, lack of training and information, increased demand on flexibility.	• Organisation of work/content of work: tight deadlines, performance pressure, high responsibility, overload, lack of training and information, increased demand on flexibility. Excessive workload: involved in the implementation/transition of industrial production towards circular economy.
	• Lack of work experiences: New software and digital devices require training, some workers may not have enough competences and may feel overloaded, not experienced enough. Deciding on circular economic and sustainable oriented strategies/products/marketing projects: increased demand on skills and knowledge/keeping up-to-date regarding the current development in circular economy and sustainable oriented strategies/products/marketing projects (staying up-to-date; further training for new technologies and processes).
• Social relationship: difficult clients, difficult colleagues.	• Social relationship: difficult clients, difficult colleagues, lack of social contacts.
• Working method: Digital equipment, software. Long period of concentration working with computer and new software and performing multitasking. Managers/workers are also at risk of being permanent available outside working hours.	• Working method: digital equipment, cognitive interactions between autonomous techniques and virtual reality, virtual conferences. Use of innovative software, digital equipment, cognitive interactions with autonomous machines and virtual reality, virtual conferences. Long period of concentration to work with computer and new software and performing multitasking. Increased demand on flexibility as workers/managers may work from everywhere with mobile devices. Managers/workers are also at risk of being permanent available outside working hours, this will increase with digitalization. Increased demand on flexibility: need of knowledge and skills concerning recycling, disassembly and remanufacture operations as well as in use of renewable energy.
Effects: stress: burnout and emotional distress, suffering from depression, cardiovascular problems, sleep disorders.	**Effects**: stress, burnout and emotional distress, suffering from depression, cardiovascular problems, sleep disorders, cognitive strain, stress due to long period of concentration and information overload.

Skills and competences needs

Forecast of training new needs due to sector circular economy transition (in green for 2030) and digitalization (in blue for 2025) for the occupational profile: Industrial production manager - ISCO 1321s

Skills, knowledge and competences	Will it continue to be needed?	Main causes/reasons of change: Shift to renewable energies	Shift to renewable materials	Increase performance/efficiency of products	Customisation/made to order	Reproductible and adaptable manufacturing	Minimize waste in production and supply chain	Increase efficiency of production processes	Remanufacture products and/or components	Recycle materials	Apply new technologies	Support by data and instruments of highly digitized systems	Use digitization tools to work in a customer-oriented manner	Exploiting the possibilities, tools and instruments of a highly connected and digitized manufacturing plant/chain	Securing distribution of information	Working in a fully connected and digitized system
Essential skills and competences																
Adhere to organisational guidelines	YES, changed	●	●	●	●	●	●	●	●	●	●					
Adjust production schedule	YES, changed											●	●	●		
Assess impact of industrial activities	YES, changed	●	●	●			●	●		●	●	●	●	●		
Check material resources	YES, changed	●	●	●			●	●	●	●	●	●	●	●		
Control financial resources	YES, changed	●	●	●			●	●		●						
Create manufacturing guidelines	YES, changed	●	●	●			●	●	●	●	●	●	●	●	●	
Define quality standards	YES, changed		●	●				●	●	●	●	●		●	●	
Liaise with industrial professionals	YES, changed	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Manage budgets	YES															
Manage resources	YES, changed	●	●	●	●		●	●		●	●	●		●		
Manage staff	YES, changed											●		●		
Manage supplies	YES, changed	●	●	●	●		●	●		●	●	●	●	●		
Meet deadlines	YES															
Oversee assembly operations	YES, changed		●		●	●		●	●	●	●	●	●	●		
Oversee production requirements	YES, changed	●	●		●	●		●	●		●	●	●	●		
Plan health and safety procedures	YES, changed	●	●	●			●	●	●	●						
Essential knowledge																
Industrial health and safety measures	YES, changed	●	●	●			●	●	●	●						
Industrial engineering	YES, changed	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Manufacturing processes	YES, changed	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Generic green skills, knowledge and competences (*)																
Environmental awareness and willingness to learn	NEW	●	●	●			●	●	●	●	●					
Systems and risk analysis skills	NEW	●	●	●			●	●	●	●						
Innovation skills	NEW	●	●	●	●	●	●	●	●	●	●					
Coordination, management and business skills	NEW	●	●	●	●	●	●	●	●	●	●					
Communication and negotiation skills	NEW	●	●	●	●		●	●		●	●					
Marketing skills	NA															
Strategic and leadership skills	NEW	●	●	●	●	●	●	●	●	●	●					
Consulting skills	NA															
Networking, information technology and language skills	NEW	●	●	●	●	●		●	●		●					
Adaptability and transferability skills	NEW	●	●	●	●	●	●	●	●	●	●					
Entrepreneurial skills	NEW			●			●	●	●	●	●					
Waste, energy and water quantification and monitoring	NEW	●		●		●	●	●			●					
Material use and impact quantification and monitoring	NEW		●	●	●	●	●	●	●	●	●					
Material use and impact minimisation	NEW		●	●	●	●	●	●	●	●	●					

(*) Source: Strietskallina et al. and Dr. Margarita Pavlova

Supply chain manager
ISCO 1324s

You will find three different types of tables for each occupational profile, where the forecasted changes due to sector circular economy transition are in green colour and due to sector digitalization are in blue colour.

Tasks changes
Current and forecasted tasks changes.

Hazards and risks changes
Current and forecasted risks changes.

Skills and competences need
Forecast of training new needs.

Supply chain manager
ISCO 1324s

Unfold this to see the current occupational profile description and its tasks and to relate them to the following green table and first yellow table.

Tasks changes

Hazards and risks changes

Hazards and risks comments

Skills and competences needs

КЪМ ИНДЕКС

Supply chain manager
ISCO 1324s

2020
Occupational profile

Current profile description
Supply chain managers plan, manage and coordinate all activities related to the sourcing and procurement of supplies needed to run manufacturing operations from the acquisition of raw materials to the distribution of finished products. The supplies can be raw materials or finished products, and it can be for internal or external use. Moreover, they plan and commission all the activities needed to be performed in manufacturing plants and adjust operations to changing levels of demand for a company's products.

	Current profiles tasks	**Regenerate**	Shift to renewable energies	Shift to renewable materials	Reclaim, retain, and regenerate health of ecosystems	Return recovered biological resources to the biosphere	**Share**	Reduce product replacement speed and increase product utilisation by sharing it among different users	Reuse products throughout their technical lifetime	Prolong products lifetime through maintenance	Prolong products lifetime through repair	Prolong products lifetime through design for durability	**Optimise**	Increase performance/efficiency of products	Customisation/made to order	Reproductible and adaptable manufacturing	Minimize waste in production and supply chain	Increase efficiency of production processes	**Loop**	Remanufacture products and/or components	Implement take-back programs	Recycle materials	Promote the cascade use of wood	Promote extraction of biochemicals from organic waste
A	Determining, implementing and monitoring purchasing, storage and distribution strategies, policies and plans.		●	●	●	●						●		●	●	●	●	●		●	●	●	●	
B	Preparing and implementing plans to maintain required stock levels at minimum cost.		●	●											●	●		●		●	●	●	●	
C	Negotiating contracts with suppliers to meet quality, cost and delivery requirements.		●	●	●	●								●	●	●	●	●		●	●	●	●	
D	Monitoring and reviewing storage and inventory systems to meet supply requirements, and control stock levels.		●	●											●	●		●			●	●		
E	Overseeing the dispatch of road vehicles, trains, vessels or aircraft.		●	●											●	●		●		●	●			
F	Operating recording systems to track all movements of goods, and ensuring reordering and restocking at optimal times.		●	●											●	●		●		●	●	●		
G	Liaising with other departments and customers concerning requirements for outward goods and associated forwarding transportation.		●	●											●	●		●		●	●	●	●	
H	Overseeing the recording of purchase, storage and distribution transactions.		●	●											●	●				●	●	●		
I	Establishing and managing budgets, controlling expenditure and ensuring the efficient use of resources.		●	●										●	●	●		●		●	●	●		
J	Establishing and directing operational and administrative procedures.		●	●											●	●		●		●	●	●		
K	Planning and directing daily operations.		●	●											●	●		●		●	●	●		
L	Overseeing the selection, training and performance of staff.		●	●				●	●	●	●	●			●	●	●	●		●	●	●	●	●

*McKinsey center and Ellen MacArthur Foundation

Tasks changes

Current and forecasted tasks changes due to sector circular economy transition (in green for 2030) and digitalization (in blue for 2025) for the occupational profile: Supply chain manager - ISCO 1324s

2025/30

Occupational profile

Description forecast of the occupational profile in 2030

Supply chain managers plan, manage and coordinate all activities related to the sourcing and procurement of supplies needed to run manufacturing operations from the preferable acquisition of sustainable raw materials to the distribution of ecodesigned finished products with the support of updated and continuous data collected in an highly connected, circular economy-oriented and digitized company system. The supplies can be sustainable raw materials or finished products (including reused/recovered or remanufactured products), and it can be for internal or external use. Moreover, they plan and commission all the activities needed to be performed in ecoefficient manufacturing plants and adjust operations to changing levels of demand for a company's sustainable product. Use digitization tools and circular economy-oriented strategies to work in a customer-oriented manner.

Virtualise	Virtualise direct aspects of the product	Virtualise indirect aspects of the product	**Exchange**	Replace old materials with advanced renewable ones	Apply new technologies	Choose new products and services		**Profile tasks forecast**
	●	●		●	●	●	A	Determining, implementing and monitoring environmentally friendly purchasing, storage and distribution strategies, policies and plans of the digitised ecosystem, aligned with the circular economy-oriented strategies of the organisation.
	●	●		●	●	●	B	Preparing and implementing plans to maintain required stock levels of the highly digitised enterprise ecosystem at minimum cost and with minimal environmental impact.
	●	●		●	●	●	C	Negotiating fair contracts with suppliers to meet quality, environmental, cost and delivery requirements of the highly digitised enterprise ecosystem, applying green purchasing criteria and boosting a sustainable supply chain.
	●	●		●	●	●	D	Monitoring and reviewing storage and inventory systems to meet supply requirements, and control stock levels through the data and instruments of an highly interconnected and digitised enterprise ecosystem, and alligned with the sustainability strategies of the organisation.
	●	●		●	●	●	E	Overseeing the dispatch of road vehicles, trains, vessels or aircraft, selecting preferably the most environmentaly friendly alternative and promoting a sustainable supply chain, through digitised updated and continuous data collected in an highly connected, and digitized enterprise ecosystem.
	●	●		●	●	●	F	Operating recording systems to track all movements of goods, and ensuring reordering and restocking at optimal times of the highly digitised enterprise ecosystem, analysing the environmental impact associated to the logistics of the raw materials and products.
	●	●		●	●	●	G	Liaising with other departments and customers concerning requirements for outward goods and associated forwarding transportation, aligned with the circular economy-oriented strategies of the organisation (for example sustainable source of materials) and using the highly digitised ecosystem inside and outside the company.
	●	●		●	●	●	H	Overseeing the recording of purchase, storage and distribution transactions as an integrated part of the digitised work process of the digital and ecoefficient factory ecosystem.
	●	●		●	●	●	I	Establishing and managing budgets, controlling expenditure and ensuring the efficient use of resources as integrated part of the highly interconnected, circular economy-oriented and digitised company ecosystem, meeting the customers' needs and expectations on sustainability (and other issues) and boosting the traction of the supply chain on sustainability.
	●	●		●	●	●	J	Establishing and directing operational and administrative procedures in the highly digitised company ecosystem, aligned with the organisation strategies and customers' demands on sustainability.
	●	●		●	●	●	K	Planning and directing daily operations both physically and digitally using the connected cloud and considering the environmental impact of these operations.
	●	●		●	●	●	L	Overseeing the selection, training and performance of staff exploting tools and instruments of a highly connected and digitized company, promoting circular-economy-oriented competences and skills.

Supply chain manager
ISCO 1324s

2020
Occupational profile

Current profile description
Supply chain managers plan, manage and coordinate all activities related to the sourcing and procurement of supplies needed to run manufacturing operations from the acquisition of raw materials to the distribution of finished products. The supplies can be raw materials or finished products, and it can be for internal or external use. Moreover, they plan and commission all the activities needed to be performed in manufacturing plants and adjust operations to changing levels of demand for a company's products.

New categorization of hazards

Current profiles tasks		**Mechanical hazards**	Unprotected moving parts[1]	Parts with hazardous shapes (cutting, pointed, rough)	Moving means of transport and tools[2]	Uncontrolled moving parts (flying objects, wood chips)	Slip and trips	Falls from height	**Ergonomic hazards**	Heavy loads/heavy dynamic work	Awkward position/unbalanced strain	Repetitive movements	Lack of exercise, inactivity	**Electrical hazards**	Electric shock	**Hazards due to physical effects/physical agents**	Noise	Vibration	Laserlight	**Fire and explosion hazards**	Flammable substances	**Work environment hazards**	Poor lighting conditions	Climate	Poor ventilation	**Hazards through dangerous substances**	Dust	Solvents (neurotoxic, allergens)	Carcinogens	New materials (e.g. Nanomaterials)	Recycled material	**Biological Hazards**	Non-targeted activities with microorganism	**Psychosocial hazards**	Excessive workloads	Low job satisfaction	Work tasks not clearly defined
A	Determining, implementing and monitoring purchasing, storage and distribution strategies, policies and plans.												●										●	●										●		●
B	Preparing and implementing plans to maintain required stock levels at minimum cost.												●										●	●										●		●
C	Negotiating contracts with suppliers to meet quality, cost and delivery requirements.												●										●	●										●		●
D	Monitoring and reviewing storage and inventory systems to meet supply requirements, and control stock levels.												●										●	●										●		●
E	Overseeing the dispatch of road vehicles, trains, vessels or aircraft.												●										●	●										●		●
F	Operating recording systems to track all movements of goods, and ensuring reordering and restocking at optimal times.												●										●	●										●		●
G	Liaising with other departments and customers concerning requirements for outward goods and associated forwarding transportation.												●										●	●										●		●
H	Overseeing the recording of purchase, storage and distribution transactions.												●										●	●										●		●
I	Establishing and managing budgets, controlling expenditure and ensuring the efficient use of resources.												●										●	●										●		●
J	Establishing and directing operational and administrative procedures.												●										●	●										●		●
K	Planning and directing daily operations.												●										●	●										●		●
L	Overseeing the selection, training and performance of staff.												●										●	●										●		●

● No changes ● Reduced due to Circular Economy ● New or increased due to Circular Economy ● Reduced due to digitalization ● New or increased due to digitalization

Hazards and risks changes

Current and forecasted tasks changes due to sector circular economy transition (in green for 2030) and digitalization (in blue for 2025) for the occupational profile: Supply chain manager - ISCO 1324s

2025/30

Occupational profile

Description forecast of the occupational profile in 2030

Supply chain managers plan, manage and coordinate all activities related to the sourcing and procurement of supplies needed to run manufacturing operations from the preferable acquisition of sustainable raw materials to the distribution of ecodesigned finished products with the support of updated and continuous data collected in an highly connected, circular economy-oriented and digitized company system. The supplies can be sustainable raw materials or finished products (including reused/recovered or remanufactured products), and it can be for internal or external use. Moreover, they plan and commission all the activities needed to be performed in ecoefficient manufacturing plants and adjust operations to changing levels of demand for a company's sustainable product. Use digitization tools and circular economy-oriented strategies to work in a customer-oriented manner.

	Poor organisation of work	Poorly designed workplace environment (incl. software)	Repetitive, monotonous work	Cognitive strain	Stress due to long period concentration and awareness	Increased demands on flexibility	Lack of work experience	Lack of involvement in making decisions that affect the worker	Ineffective communication, lack of support from management or colleagues	Working alone/isolation	Workload: overload/underload	Profile tasks forecast
A	●	●		●	●	●	●		●		●	Determining, implementing and monitoring environmentally friendly purchasing, storage and distribution strategies, policies and plans of the digitised ecosystem, aligned with the circular economy-oriented strategies of the organisation.
B	●	●		●	●	●	●		●	●	●	Preparing and implementing plans to maintain required stock levels of the highly digitised enterprise ecosystem at minimum cost and with minimal environmental impact.
C	●	●		●	●	●	●		●		●	Negotiating fair contracts with suppliers to meet quality, environmental, cost and delivery requirements of the highly digitised enterprise ecosystem, applying green purchasing criteria and boosting a sustainable supply chain.
D	●	●		●	●	●	●		●		●	Monitoring and reviewing storage and inventory systems to meet supply requirements, and control stock levels through the data and instruments of an highly interconnected and digitised enterprise ecosystem, and alligned with the sustainability strategies of the organisation.
E	●	●		●	●	●	●		●	●	●	Overseeing the dispatch of road vehicles, trains, vessels or aircraft, selecting preferably the most environmentaly friendly alternative and promoting a sustainable supply chain, through digitised updated and continuous data collected in an highly connected, and digitized enterprise ecosystem.
F	●	●		●	●	●	●		●	●	●	Operating recording systems to track all movements of goods, and ensuring reordering and restocking at optimal times of the highly digitised enterprise ecosystem, analysing the environmental impact associated to the logistics of the raw materials and products.
G	●	●		●	●	●	●		●		●	Liaising with other departments and customers concerning requirements for outward goods and associated forwarding transportation, aligned with the circular economy-oriented strategies of the organisation (for example sustainable source of materials) and using the highly digitised ecosystem inside and outside the company.
H	●	●		●	●	●	●		●	●	●	Overseeing the recording of purchase, storage and distribution transactions as an integrated part of the digitised work process of the digital and ecoefficient factory ecosystem.
I	●	●		●	●	●	●		●	●	●	Establishing and managing budgets, controlling expenditure and ensuring the efficient use of resources as integrated part of the highly interconnected, circular economy-oriented and digitised company ecosystem, meeting the customers' needs and expectations on sustainability (and other issues) and boosting the traction of the supply chain on sustainability.
J	●	●		●	●	●	●		●	●	●	Establishing and directing operational and administrative procedures in the highly digitised company ecosystem, aligned with the organisation strategies and customers' demands on sustainability.
K	●	●		●	●	●	●		●		●	Planning and directing daily operations both physically and digitally using the connected cloud and considering the environmental impact of these operations.
L	●	●		●	●	●	●		●		●	Overseeing the selection, training and performance of staff exploting tools and instruments of a highly connected and digitized company, promoting circular-economy-oriented competences and skills.

1 Cobotics (Squeezing, bumping, crushing, cutting, amputation, drawing-in/trapping).
2 Run over, roll over, falls from height.

Hazards and risks changes

Current and forecasted risks changes due to sector circular economy transition (in green for 2030) and digitalization (in blue for 2025) for the occupational profile: Supply chain manager - ISCO 1324s

2020 Current situation	2025-30 Situation forecast
Work system/work area: office work, business trips, contact with clients and business partners, use of complex software.	Work system/work area: office work, business trips, contact with clients and business partners, use of complex software, use of digitalized tools and circular economy-oriented strategies.
Mechanical hazards	
• Slips and trips, obstacles, table edges. **Effects:** squeezing, cutting, twisting, spraining, bumps and bruises.	• Slips and trips, obstacles, table edges. **Effects:** squeezing, cutting, twisting, spraining, bumps and bruises.
Ergonomic hazards	
• Ergonomic hazards: from poor ergonomic conditions and inactivity. **Effects:** musculoskeletal diseases, overweight, cardiovascular problems.	• Ergonomic hazards: from poor ergonomic conditions and inactivity. Digitalization put workers at risk of being exposed to ergonomic hazards such as lack of exercise/inactivity because of operating autonomous equipment from their office, participating in virtual conferences and online platforms. Effects: musculoskeletal diseases, overweight, cardiovascular problems.
Electrical hazards	
• Electrical hazards: contacts with live parts, defective cables (Computer and other electric devices). **Effect:** fatal accident.	• Electrical hazards: contacts with live parts, defective cables (Computer and other electric devices). **Effect:** fatal accident.
Work environmental hazards	
• Work environmental hazards: software not appropriate, poor lighting and inappropriate indoor air quality and temperature. **Effects:** eyestrain, headache, colds, cardiovascular problems.	• Work environmental hazards: software not appropriate, poor lighting and inappropriate indoor air quality and temperature. **Effects:** eyestrain, headache, colds, cardiovascular problems.
Psychosocial hazards	
• Organisation of work/content of work: tight deadlines, performance pressure, high responsibility, overload, lack of training and information.	• Organisation of work/content of work: tight deadlines, performance pressure, high responsibility, overload, lack of training and information, increased demand on flexibility. Increased demand on competences and up-to-date knowledge on the current development in circular economy and recycling industry.
• Social relationship: difficult clients, difficult colleagues.	• Social relationship: difficult clients, lack of social contacts.
• Working method: digital equipment, software. Long period of concentration working with computer and new software and performing multitasking. Managers/workers are also at risk of being permanent available outside working hours.	• Working method: digital equipment, cognitive interactions with autonomous technologies and virtual reality, virtual conferences. Digitalization may put workers more at risk of long period of concentration working with computer and new software and performing multitasking. Increased demand on flexibility as workers/managers may work from everywhere with mobile devices. Managers/workers are also at risk of being permanent available outside working hours. • Lack of work experience: new software and digital devices require training, some workers may not have enough competences and may feel overloaded, not experienced enough. Deciding on circular economic and sustainable oriented strategies/products/marketing projects: increased demand on skills and knowledge/keeping up-to-date regarding the current development in circular economy and sustainable oriented strategies/products/marketing projects (staying up-to-date; further training for new technologies and processes).
Effects: stress, burnout and emotional distress, suffering from depression, cardiovascular problems, sleep disorders.	**Effects**: stress, burnout and emotional distress, suffering from depression, cardiovascular problems, sleep disorders, cognitive strain, stress due to long period of concentration.

Skills and competences needs

Forecast of training new needs due to sector circular economy transition (in green for 2030) and digitalization (in blue for 2025) for the occupational profile: Supply chain manager - ISCO 1324s

Skills, knowledge and competences	Will it continue to be needed?	Main causes/reasons of change: Shift to renewable energies	Shift to renewable materials	Customisation/made to order	Reproductible and adaptable manufacturing	Implement Take Back programs	Virtualise direct aspects of the product	Virtualise indirect aspects of the product	Replace old materials with advanced renewable ones	Apply new technologies	Choose new products and services	Using the updated and continuous data and instruments, collected in an highly connected and digitized company systems	Use digitization tools to work in a customer-oriented manner	Working in a highly digitized enterprise ecosystem	Using the highly digitized ecosystem inside and outside the company	Using resources as an integrated part of the highly interconnected and digitized company ecosystem
Essential skills and competences																
Analyse logistic changes	YES, changed	●	●	●	●	●			●	●	●	●	●		●	●
Analyse supply chain strategies	YES, changed	●	●	●		●				●	●	●	●		●	●
Analyse supply chain trends	YES, changed	●	●	●	●	●	●	●	●	●	●		●		●	
Assess supplier risks	YES, changed	●	●	●		●			●	●	●	●			●	
Estimate costs of required supplies	YES, changed											●				●
Follow company standards	YES, changed	●	●	●	●	●	●	●	●	●	●	●	●			
Liaise with managers	YES, changed														●	●
Maintain relationship with customers	YES, changed		●	●		●	●	●	●	●	●		●		●	
Maintain relationship with suppliers	YES, changed	●	●	●	●	●			●	●	●		●		●	
Manage inventory	YES, changed		●	●		●				●	●					
Manage supplies	YES, changed	●	●	●		●	●	●	●	●	●	●	●		●	●
Order supplies	YES, changed	●	●	●		●			●	●	●					
Strive for company growth	YES, changed	●	●	●	●	●	●	●	●	●	●	●	●		●	●
Essential knowledge																
Corporate social responsibility	YES, changed	●	●	●	●	●	●	●	●	●	●					
Supplier management	YES, changed	●	●	●		●			●	●	●	●	●			
Supply chain management	YES, changed	●	●	●		●			●	●	●				●	●
Supply chain principles	YES, changed	●	●	●		●			●	●	●					
Generic green skills, knowledge and competences (*)																
Environmental awareness and willingness to learn	NEW	●	●	●	●	●	●	●	●	●	●					
Systems and risk analysis skills	NEW	●	●	●		●			●	●	●					
Innovation skills	NEW	●	●	●					●	●	●					
Coordination, management and business skills	NEW	●	●	●	●	●			●	●	●					
Communication and negotiation skills	NEW	●	●	●	●	●			●	●	●					
Marketing skills	NEW	●	●	●		●	●	●	●	●	●					
Strategic and leadership skills	NEW	●	●	●						●	●					
Consulting skills	NA															
Networking, information technology and language skills	NEW	●	●	●		●			●	●	●					
Adaptability and transferability skills	NEW	●	●	●	●	●	●	●	●	●	●					
Entrepreneurial skills	NEW					●			●	●	●					
Waste, energy and water quantification and monitoring	NEW	●	●		●	●			●	●	●					
Material use and impact quantification and monitoring	NEW	●	●		●	●			●	●	●					
Material use and impact minimisation	NEW	●	●	●	●	●	●	●	●	●	●					

(*) Source: Strietskallina et al. and Dr. Margarita Pavlova

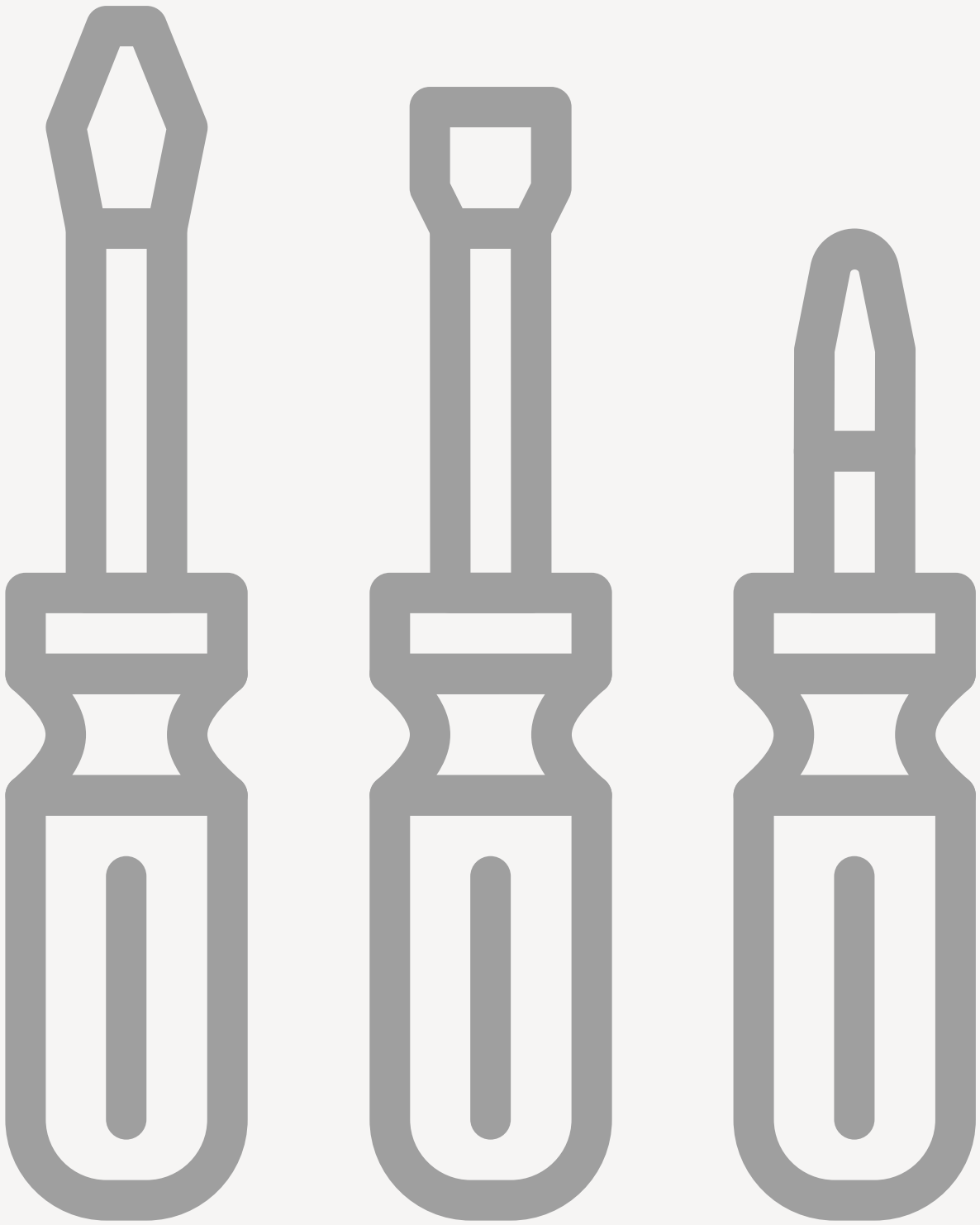
Maintenance & repair engineer
ISCO 2141s

You will find three different types of tables for each occupational profile, where the forecasted changes due to sector circular economy transition are in green colour and due to sector digitalization are in blue colour.

Tasks changes
Current and forecasted tasks changes.

Hazards and risks changes
Current and forecasted risks changes.

Skills and competences need
Forecast of training new needs.



Maintenance & repair engineer
ISCO 2141s

Unfold this to see the current occupational profile description and its tasks and to relate them to the following green table and first yellow table.

Tasks changes

Hazards and risks changes

Hazards and risks comments

Skills and competences needs

КЪМ ИНДЕКС

Maintenance & repair engineer ISCO 2141s

2020
Occupational profile

Current profile description
Maintenance and repair engineers focus on the optimization of equipment, procedures, machineries and infrastructure. They ensure their maximum availability at minimum costs.

- Works in accordance with basic health and safety regulations, including environmental protection and efficient energy use.
- Works in a customer-oriented manner.
- Considers cost- and time-effectiveness when planning and organizing his/her work in his/her area of influence.
- Contributes to continuous improvement of work processes in the company.
- Coordinates work with the rest of the team, report to his/her team leader.
- Cooperates with other departments (administrative, commercial and technical services).
- Assists in the implementation of quality assurance activities.

Current profiles tasks		ReSOLVE levers*																							
		Regenerate	Shift to renewable energies	Shift to renewable materials	Reclaim, retain, and regenerate health of ecosystems	Return recovered biological resources to the biosphere	**Share**	Reduce product replacement speed and increase product utilisation by sharing it among different users	Reuse products throughout their technical lifetime	Prolong products lifetime through maintenance	Prolong products lifetime through repair	Prolong products lifetime through design for durability	**Optimise**	Increase performance/efficiency of products	Customisation/made to order	Reproductible and adaptable manufacturing	Minimize waste in production and supply chain	Increase efficiency of production processes	**Loop**	Remanufacture products and/or components	Implement take-back programs	Recycle materials	Promote the cascade use of wood	Promote extraction of biochemicals from organic waste	
A	Establishing standards and policies for installation, modification, quality control, testing, inspection and maintenance according to engineering principles and safety regulations.		●	●										●	●	●	●	●				●	●		
B	Inspecting plant to improve and maintain performance.		●	●											●	●	●	●				●			
C	Directing the maintenance of plant buildings and equipment, and coordinating the requirements for new designs, surveys and maintenance schedules. **Preventive maintenance:** • Checks the operation of the machines, instruments (for measuring pressure, flow, temperature...) and the critical wear points, lubrication points, ... • Maintains the machine or installation preventively. **Predictive maintenance:** • Analyses the working condition of installation or machines, to predict faults on the basis of indications (via measurements and data collection). • Formulates recommendations for possible interventions. **Corrective maintenance:** • Locates and diagnoses a defect or malfunction. • Replaces, repairs and tests the defective parts and adjusts them. • Performs preparatory tests before releasing the machine or installation. **Adaptive maintenance: modifications, changes:** • Provides technical support to other departments (production, quality...). • Plans, develops, executes approved modifications to the installation(s).		●	●											●	●	●	●				●			
D	Advising management on new production methods, techniques and equipment.		●	●										●	●	●	●	●			●	●	●		
E	Liaising with materials buying, storing and controlling departments to ensure a steady flow of supplies.		●	●										●	●	●	●	●				●			

*McKinsey center and Ellen MacArthur Foundation

Tasks changes

Current and forecasted tasks changes due to sector circular economy transition (in green for 2030) and digitalization (in blue for 2025) for the occupational profile: Maintenance & repair engineer - ISCO 2141s

2025/30

Occupational profile

Description forecast of the occupational profile in 2030

Maintenance and repair engineers focus on the optimization of equipment, procedures, machineries and infrastructure in a highly integrated digital ecosystem of the digital and ecoefficient manufacturing plant. They ensure their maximum availability at minimum costs and environmental impact.

- Works in accordance with basic health and safety regulations, including environmental protection and efficient energy use.
- Use digitization tools to work in a customer-oriented manner.
- Considers cost, environmental impact and time-effectiveness when planning and organizing his/her work in his/her area of influence.
- Contributes to continuous improvement of work processes in the company.
- Coordinates work with the rest of the team, report to his/her team leader.
- Cooperates with other departments (administrative, commercial, technical and ICT services).
- Assists in the implementation of quality assurance and sustainability activities.
- Assists in the reduction of the environmental impact of the manufacturing, repair, remanufacturing or recycling processes (e.g. waste generation or energy use reduction, recycling programs, green energy use, etc.).

Virtualise	Virtualise direct aspects of the product	Virtualise indirect aspects of the product	**Exchange**	Replace old materials with advanced renewable ones	Apply new technologies	Choose new products and services	**Profile tasks forecast**	
		●		●	●	●	A	Establishing standards and policies for installation, modification, quality control, testing, inspection and maintenance according to engineering principles, sustainability-oriented strategies and safety regulations in a highly digitised and ecoefficient manufacturing plant ecosystem.
		●		●	●	●	B	Monitoring, inspection and digital registration of the plant to improve and maintain its technical and environmental performance (e.g. energy use, waste generation, air & water emissions, etc.).
		●		●	●	●	C	Directing the digital handling of the maintenance of plant buildings and equipment, and coordinating the requirements for new designs, surveys and maintenance schedules, aligned with the sustainability strategies of the organisation. **Preventive maintenance:** • Checks the operation of the machines, instruments (for measuring pressure, flow, temperature...) and the critical wear points, lubrication points, ... • Maintains the machine or installation preventively. **Predictive maintenance:** • Analyses the working condition of installation or machines, to predict faults on the basis of indications (via measurements and data collection). • Formulates recommendations for possible interventions. **Corrective maintenance:** • Locates and diagnoses a defect or malfunction. • Replaces, repairs and tests the defective parts and adjusts them. • Performs preparatory tests before releasing the machine or installation. **Adaptive maintenance: modifications, changes:** • Provides technical support to other departments (production, quality, ICT...). • Plans, develops, executes approved modifications to the installation(s). • Analyses how to reduce the environmental impact of the plant and proposes modifications.
	●	●		●	●	●	D	Advising management on new smarter and ecoefficient production methods, and best-available and digital techniques and equipment; considering the reduction of the environmental impact of the plant (e.g. reduction of raw materials, energy, waste, etc.).
		●		●	●	●	E	Liaising with materials purchaising, storing and controlling departments to ensure a steady flow of sustainable supplies within and around the entire digital ecosystem and following green purchasing criteria.

КЪМ ИНДЕКС

Maintenance & repair engineer ISCO 2141s

2020

Occupational profile

Current profile description

Maintenance and repair engineers focus on the optimization of equipment, procedures, machineries and infrastructure. They ensure their maximum availability at minimum costs.

- Works in accordance with basic health and safety regulations, including environmental protection and efficient energy use.
- Works in a customer-oriented manner.
- Considers cost- and time-effectiveness when planning and organizing his/her work in his/her area of influence.
- Contributes to continuous improvement of work processes in the company.
- Coordinates work with the rest of the team, report to his/her team leader.
- Cooperates with other departments (administrative, commercial and technical services).
- Assists in the implementation of quality assurance activities.

Current profiles tasks		New categorization of hazards: Mechanical hazards	Unprotected moving parts[1]	Parts with hazardous shapes (cutting, pointed, rough)	Moving means of transport and tools[2]	Uncontrolled moving parts (flying objects, wood chips)	Slip and trips	Falls from height	Ergonomic hazards	Heavy loads/heavy dynamic work	Awkward position/unbalanced strain	Repetitive movements	Lack of exercise, inactivity	Electrical hazards	Electric shock	Hazards due to physical effects/physical agents	Noise	Vibration	Laserlight	Fire and explosion hazards	Flammable substances	Work environment hazards	Poor lighting conditions	Climate	Poor ventilation	Hazards through dangerous substances	Dust	Solvents (neurotoxic, allergens)	Carcinogens	New materials (e.g. Nanomaterials)	Recycled material	Biological Hazards	Non-targeted activities with microorganism	Psychosocial hazards	Excessive workloads	Low job satisfaction	Work tasks not clearly defined
A	Establishing standards and policies for installation, modification, quality control, testing, inspection and maintenance according to engineering principles and safety regulations.										●		●										●	●										●		●
B	Inspecting plant to improve and maintain performance.		●		●		●								●		●	●					●	●	●		●	●	●	●			●		●	
C	Directing the maintenance of plant buildings and equipment, and coordinating the requirements for new designs, surveys and maintenance schedules. **Preventive maintenance:** • Checks the operation of the machines, instruments (for measuring pressure, flow, temperature...) and the critical wear points, lubrication points, ... • Maintains the machine or installation preventively. **Predictive maintenance:** • Analyses the working condition of installation or machines, to predict faults on the basis of indications (via measurements and data collection). • Formulates recommendations for possible interventions. **Corrective maintenance:** • Locates and diagnoses a defect or malfunction. • Replaces, repairs and tests the defective parts and adjusts them. • Performs preparatory tests before releasing the machine or installation. **Adaptive maintenance: modifications, changes:** • Provides technical support to other departments (production, quality...). • Plans, develops, executes approved modifications to the installation(s).		●	●	●	●	●			●	●			●		●	● ●	●	●		●		●	●	●		●	●	●	●			●		●	●	
D	Advising management on new production methods, techniques and equipment.																						●	●										●		●	
E	Liaising with materials buying, storing and controlling departments to ensure a steady flow of supplies.																						●	●										●		●	

● No changes ● Reduced due to Circular Economy ● New or increased due to Circular Economy ● Reduced due to digitalization ● New or increased due to digitalization

Hazards and risks changes

Current and forecasted tasks changes due to sector circular economy transition (in green for 2030) and digitalization (in blue for 2025) for the occupational profile: Maintenance & repair engineer - ISCO 2141s

2025/30

Occupational profile

Description forecast of the occupational profile in 2030

Maintenance and repair engineers focus on the optimization of equipment, procedures, machineries and infrastructure in a highly integrated digital ecosystem of the digital and ecoefficient manufacturing plant. They ensure their maximum availability at minimum costs and environmental impact.

- Works in accordance with basic health and safety regulations, including environmental protection and efficient energy use.
- Use digitization tools to work in a customer-oriented manner.
- Considers cost, environmental impact and time-effectiveness when planning and organizing his/her work in his/her area of influence.
- Contributes to continuous improvement of work processes in the company.
- Coordinates work with the rest of the team, report to his/her team leader.
- Cooperates with other departments (administrative, commercial, technical and ICT services).
- Assists in the implementation of quality assurance and sustainability activities.
- Assists in the reduction of the environmental impact of the manufacturing, repair, remanufacturing or recycling processes (e.g. waste generation or energy use reduction, recycling programs, green energy use, etc.).

Poor organisation of work	Poorly designed workplace environment (incl. software)	Repetitive, monotonous work	Cognitive strain	Stress due to long period concentration and awareness	Increased demands on flexibility	Lack of work experience	Lack of involvement in making decisions that affect the worker	Ineffective communication, lack of support from management or colleagues	Working alone/isolation	Workload: overload/underload		**Profile tasks forecast**
●	●		●	●	●	●		●	●	●	A	Establishing standards and policies for installation, modification, quality control, testing, inspection and maintenance according to engineering principles, sustainability-oriented strategies and safety regulations in a highly digitised and ecoefficient manufacturing plant ecosystem.
●	●		●	●	●	●		●	●	●	B	Monitoring, inspection and digital registration of the plant to improve and maintain its technical and environmental performance (e.g. energy use, waste generation, air & water emissions, etc.).
●	●		●	●	●	●		●	●	●	C	Directing the digital handling of the maintenance of plant buildings and equipment, and coordinating the requirements for new designs, surveys and maintenance schedules, aligned with the sustainability strategies of the organisation. **Preventive maintenance:** • Checks the operation of the machines, instruments (for measuring pressure, flow, temperature...) and the critical wear points, lubrication points, ... • Maintains the machine or installation preventively. **Predictive maintenance:** • Analyses the working condition of installation or machines, to predict faults on the basis of indications (via measurements and data collection). • Formulates recommendations for possible interventions. **Corrective maintenance:** • Locates and diagnoses a defect or malfunction. • Replaces, repairs and tests the defective parts and adjusts them. • Performs preparatory tests before releasing the machine or installation. **Adaptive maintenance: modifications, changes:** • Provides technical support to other departments (production, quality, ICT...). • Plans, develops, executes approved modifications to the installation(s). • Analyses how to reduce the environmental impact of the plant and proposes modifications.
●	●		●	●	●	●		●		●	D	Advising management on new smarter and ecoefficient production methods, and best-available and digital techniques and equipment; considering the reduction of the environmental impact of the plant (e.g. reduction of raw materials, energy, waste, etc.).
●	●		●	●	●	●		●		●	E	Liaising with materials purchaising, storing and controlling departments to ensure a steady flow of sustainable supplies within and around the entire digital ecosystem and following green purchasing criteria.

1 Cobotics (Squeezing, bumping, crushing, cutting, amputation, drawing-in/trapping).
2 Run over, roll over, falls from height.

Hazards and risks changes

Current and forecasted risks changes due to sector circular economy transition (in green for 2030) and digitalization (in blue for 2025) for the occupational profile: Maintenance & repair engineer - ISCO 2141s

2020 Current situation	2025-30 Situation forecast
Work system/work area: working on a wide variety of machines and workplaces, use of complex test devices and software. Working in the maintenance sector often means working during stop, start-up, shut-down, or disrupted operating phases, giving rise to potential risks in terms of accidents or exposure to many hazards. The work often requires maintenance workers to remove or dismantle collective protective equipment; as such equipment is not effective for their type of work. Maintenance workers have more serious and more frequent accidents than production workers. More so than for any other activity, maintenance-related accidents are characterised by their many different causes.	Work system/work area: working on a wide variety of machines and workplaces, use of complex test devices and software, use of digitalized instruments. Working in the maintenance sector often means working during stop, start-up, shut-down, or disrupted operating phases, giving rise to potential risks in terms of accidents or exposure to many hazards. The work often requires maintenance workers to remove or dismantle collective protective equipment; as such equipment is not effective for their type of work. Maintenance workers have more serious and more frequent accidents than production workers. More so than for any other activity, maintenance-related accidents are characterised by their many different causes. Maintenance of power plant stations (own green energy production), wastewater and waste treatment systems and recycling programs.
Mechanical hazard	
• Mechanical hazards from moving machines and tools.	• Mechanical hazards from moving machines and tools and from moving cobots and robots. Risks from mechanical hazards may decrease, depending on takeover of specific task by cobots/robots. Better design of products (ecodesign) could reduce hazards associated to maintenance operations.
Effects: severe bruises, amputations, cuts and sharp injuries, crushing.	**Effects**: severe bruises, amputations, cuts and sharp injuries, crushing.
• Slips and trips, obstacles, table edges, moving vehicles, machines.	• Slips and trips, obstacles, table edges, moving vehicles, machines.
Effects: squeezing, cutting, twisting, spraining, bumps and bruises.	**Effects**: squeezing, cutting, twisting, spraining, bumps and bruises.
Ergonomic hazards	
• Ergonomic hazards: from poor ergonomic conditions, awkward position, confined spaces, heavy physical workload.	• Ergonomic hazards: from poor ergonomic conditions, awkward position, confined spaces, heavy physical workload. In spite of this, risks from ergonomic hazards may decrease, depending on take over of specific task by cobots/robots. On the other hand, workers are increasingly exposed to ergonomic hazards such as lack of exercise/inactivity because of operating autonomous machines and cobots from computer workstations. Ecodesign may help to reduce exposure to awkward positions of maintenance workers if safe maintenance of the machinery is taken into consideration from the beginning.
Effect: musculoskeletal diseases.	**Effects**: musculoskeletal diseases.
Electrical hazards	
• Electrical hazards: contacts with live parts or connections or exposure to arc flash.	• Electrical hazards: contacts with live parts or connections or exposure to arc flash. Electrical hazards from woodworking machines (maybe broken) during maintenance and repair as well as from autonomous or highly autonomous equipment.
Effect: fatal accident.	**Effect**: fatal accident.
Hazards due to physical effects/physical agents	
• Noise	• Noise: exposure to noise and vibration may decrease, depending on takeover of specific tasks by cobots/robots. Noise maybe reduced due to ecodesign of machinery operating quieter and more environmental-friendly.
Effects: hearing loss, headache, nervousness, poor concentration.	**Effects**: hearing loss, headache, nervousness, poor concentration.
• Vibrations	• Vibrations: exposure to vibration risks may decrease, depending on takeover of specific task by cobots/robots. Vibration maybe reduced due to ecodesign of machinery operating with less vibration energy and more environmental-friendly.
Effects: hand-arm-vibration syndrome (e.g. white finger disease).	**Effects**: hand-arm-vibration syndrome (e.g. white finger disease).
Explosion and fire hazards	
• Explosion and fire hazards from materials, including wood dust, solvents and chemicals.	Explosion and fire hazards from materials, including wood dust, solvents and chemicals. Risks from explosion and fire may decrease, depending on takeover of specific task by cobots/robots. Solvents and cleaning products used for maintenance tasks may be based on less hazardous substances (e.g. solvents) and prevent fire hazards.
Effects: burns, fatal accidents.	**Effects**: burns, fatal accidents.

2020 Current situation	2025-30 Situation forecast
Work environmental hazards	
Work environmental hazards: excessive heat and cold, poor lighting.	Work environmental hazards: poor lighting, climate and temperature.
Effects: cardiovascular diseases, negative effects on muscles, tendons and joints, cold, eye strain, poor concentration.	**Effects**: cardiovascular diseases, negative effects on muscles, tendons and joints, cold, eye strain, headache, poor concentration.
Hazards through dangerous substances	
• Chemical hazards/ dangerous substances: asbestos, glass fibre, vapours, fumes, dust, solvents. Injury of the eyes caused by splashing lubricants, allergies due to contact with solvents, oils, hydraulic fluids and lubricants, exposure to dust. Contact with substances that are generated as by-products during maintenance activities and by the equipment used, such as welding fumes, diesel exhaust (e.g. from generators), and sanding dust.	• Chemical hazards/ dangerous substances: asbestos, glass fibre, vapours, fumes, dust, solvents, new materials. Injury of the eyes caused by splashing lubricants, allergies due to contact with solvents, oils, hydraulic fluids and lubricants, exposure to dust. Contact with substances that are generated as by-products during maintenance activities and by the equipment used, such as welding fumes, diesel exhaust (e.g. from generators), and sanding dust. The risk of being exposed to chemicals may decrease, depending on takeover of specific tasks by cobots/robots. Risks may decrease with use of cobots/robots. Maybe reduced, if the use of hazardous chemicals in products used for maintenance will be reduced/substituted due to circular economy.
Effects: contamination/intoxication, skin diseases, respiratory diseases, cancer.	**Effects**: contamination/intoxication, skin diseases, respiratory diseases, cancer. New materials (e.g. nanomaterials): Nanotechnology and nanomaterials may be used in woods as well as wood-composite materials in order to improve some of their properties, e.g. to improve the water resistance or thermal conductivity. **Effects**: not yet well known, included are among others inflammation and tissue damage, fibrosis and tumour generation. Recycling programs: Recycled material may contain dangerous substances, to the latest findings carcinogen or repro-toxic. (nowadays restricted by law (REACH)). **Effects**: contamination/intoxication, skin diseases, respiratory diseases, cancer.
• Biological hazards: bacteria, mould and fungi (e.g. lubricants may contain biological hazards).	• Biological hazards: bacteria, mould and fungi (e.g. lubricants may contain biological hazards). Risk from non-targeted activities with microorganism. Risks may decrease with use of cobots/robots. Maintenance of machinery and systems such as: waste treatment, waste water treatment systems and power plant stations. New Companies using their own waste as an energy source (Shifting to renewable energies – e.g. from biomass), operate their own waste water treatment system.
Effects: contamination/intoxication, skin diseases, respiratory diseases, infections.	**Effects**: contamination/intoxication, allergies, skin diseases, respiratory diseases, infections.
Psychosocial hazards	
• Organisation of work: time pressure, shift work, stress, often related to poor work organisation and lack of training.	Organisation of work: time pressure, shift work, stress, often related to poor work organisation lack of training and increased demand on flexibility and digital know how. Lack of experience: New software and digital devices require training, some workers may not have enough competences and may feel overloaded, not experienced enough. Increased demand on competences and up-to-date knowledge on the current development in circular economy and recycling industry. Working with materials which have previously been manufactured: new skills need to be acquired throughout the production cycle. Repair, remanufacture and selective disassembly require new methods and procedures.
• Social relationship: difficult discussion with the management, difficult partners, lack of information.	• Social relationship: difficult discussion with the management, difficult partners, lack of information, lack of social contacts.
• Working method: teamwork, working outside of "core working hours".	Working method: working outside of "core working hours", digital equipment, cognitive interactions between autonomous techniques. The use of cobots and other digital techniques may increase the risk of working alone and feeling isolated. Cognitive interactions between a robot and a human worker can lead to mental stress. Long period of concentration working with computer and new software and performing multitasking, increased demand on flexibility as workers may work from everywhere with mobile devices. Workers are also at risk of being permanent available outside working hours. Maintenance of machines and plants emerged from circular economic and sustainable oriented strategies/products/marketing projects.
Effects: stress, burnout.	**Effects**: stress, burnout.

Skills and competences needs

Forecast of training new needs due to sector circular economy transition (in green for 2030) and digitalization (in blue for 2025) for the occupational profile: Maintenance & repair engineer - ISCO 2141s

Skills, knowledge and competences	Will it continue to be needed?	Main causes/reasons of change: Shift to renewable energies	Shift to renewable materials	Customisation/made to order	Reproductible and adaptable manufacturing	Minimize waste in production and supply chain	Increase efficiency of production processes	Recycle materials	Virtualise indirect aspects of the product	Replace old materials with advanced renewable ones	Apply new technologies	Choose new products and services	Working in a highly integrated digital ecosystem of the digital manufacturing plant	Use digitization tools to work in a customer-oriented manner	Monitoring and inspection using big data	Digital handling and registration	Using new smarter production methods, digital techniques and equipment
Essential skills and competences																	
Advise on efficiency improvements	YES, changed	●	●	●	●	●	●	●	●	●	●	●		●	●		●
Conduct quality control analysis	YES, changed			●	●			●	●	●	●			●	●		
Conduct routine machinery checks	YES, changed	●			●		●				●						
Create solutions to problems	YES, changed	●	●	●	●	●	●	●	●	●	●	●		●			●
Inspect industrial equipment	YES, changed	●			●		●				●						
Inspect machinery	YES, changed	●			●		●				●						
Maintain equipment	YES, changed	●			●		●				●			●	●		●
Maintain machinery	YES, changed	●			●		●				●			●	●		●
Manage budgets	YES, changed	●	●	●	●	●	●	●		●	●	●		●	●	●	
Perform machine maintenance	YES, changed														●		●
Perform test run	YES, changed														●		●
Resolve equipment malfunctions	YES, changed														●		●
Troubleshoot	YES, changed														●		●
Use testing equipment	YES, changed														●		●
Work safely with machines	YES, changed	●	●	●	●		●		●	●	●	●	●				●
Write technical reports	YES, changed	●	●	●	●		●			●	●				●	●	
Essential knowledge																	
Engineering principles	YES																
Engineering processes	YES																
Maintenance and repair	YES, changed													●	●		●
Mechanics	YES																
Quality assurance procedures	YES, changed	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
Generic green skills, knowledge and competences (*)																	
Environmental awareness and willingness to learn	NEW	●	●	●	●	●	●	●	●	●	●	●					
Systems and risk analysis skills	NEW	●	●				●	●		●	●	●					
Innovation skills	NEW	●	●	●	●	●	●	●	●	●	●	●					
Coordination, management and business skills	NA																
Communication and negotiation skills	NEW	●	●	●	●	●		●		●	●	●					
Marketing skills	NA																
Strategic and leadership skills	NA																
Consulting skills	NA																
Networking, information technology and language skills	NEW	●	●	●	●					●	●	●					
Adaptability and transferability skills	NEW	●	●	●	●					●	●	●					
Entrepreneurial skills	NA																
Waste, energy and water quantification and monitoring	NEW	●				●	●	●	●	●	●	●					
Material use and impact quantification and monitoring	NEW		●			●	●	●	●	●	●						
Material use and impact minimisation	NEW		●					●	●	●	●						

(*) Source: Strietskallina et al. and Dr. Margarita Pavlova

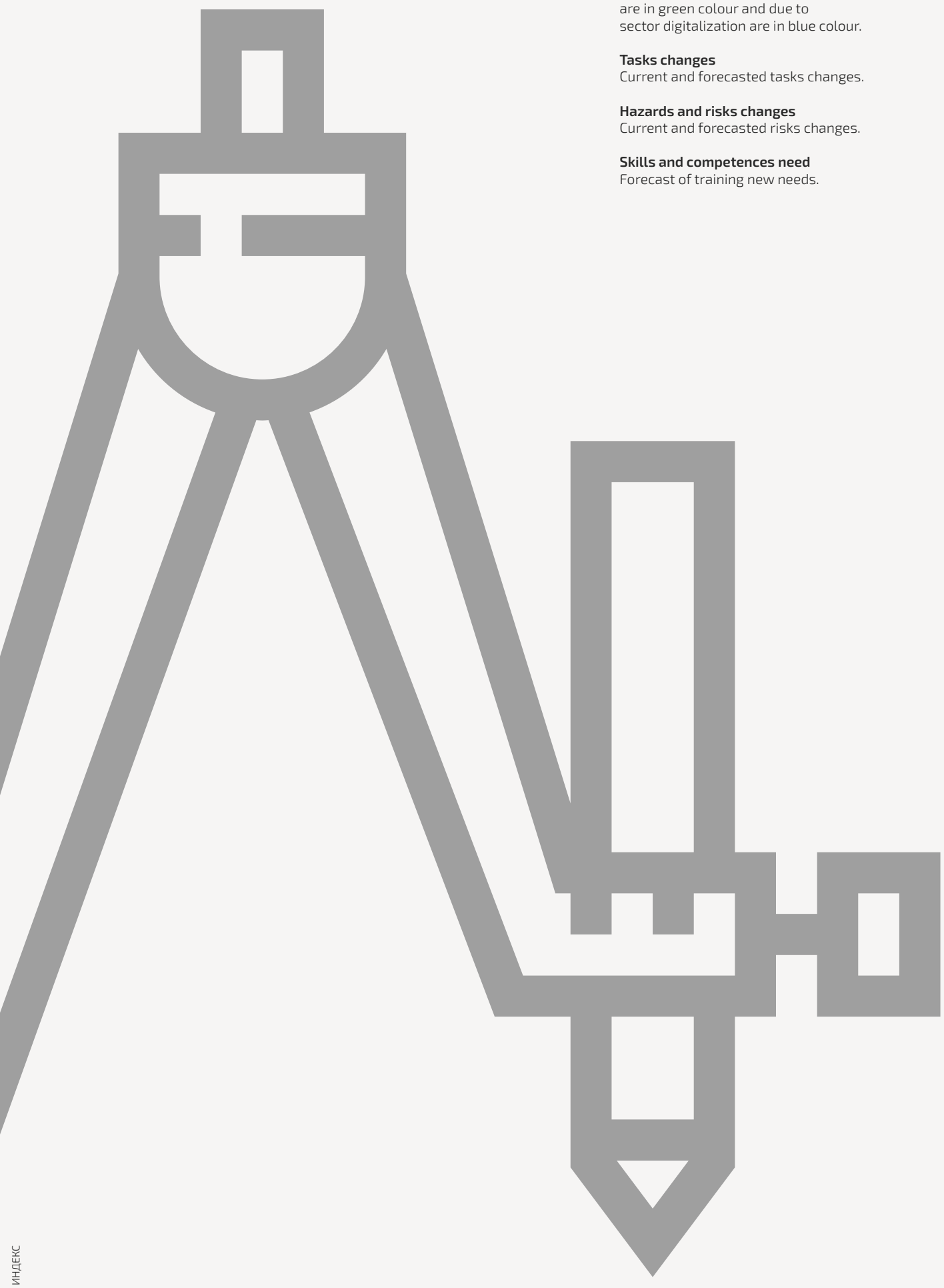
Furniture designer
ISCO 2163s

You will find three different types of tables for each occupational profile, where the forecasted changes due to sector circular economy transition are in green colour and due to sector digitalization are in blue colour.

Tasks changes
Current and forecasted tasks changes.

Hazards and risks changes
Current and forecasted risks changes.

Skills and competences need
Forecast of training new needs.



Furniture designer
ISCO 2163s

Unfold this to see the current occupational profile description and its tasks and to relate them to the following green table and first yellow table.

Tasks changes

Hazards and risks changes

Hazards and risks comments

Skills and competences needs

КЪМ ИНДЕКС

Furniture designer
ISCO 2163s

2020
Occupational profile

Current profile description
Furniture designers work on items of furniture and related products. They design the product and are involved in its production as craftsmen and designers or makers. The conception of furniture combines innovative design, functional requirements and aesthetic appeal.
- Works in a customer-oriented manner.
- Considers cost- and time-effectiveness.
- Contributes to continuous improvement of work processes in the company.
- Cooperates with other departments (administrative, commercial and technical services).
- Assists in the implementation of quality assurance activities.

Current profiles tasks		ReSOLVE levers*																							
		Regenerate	Shift to renewable energies	Shift to renewable materials	Reclaim, retain, and regenerate health of ecosystems	Return recovered biological resources to the biosphere	**Share**	Reduce product replacement speed and increase product utilisation by sharing it among different users	Reuse products throughout their technical lifetime	Prolong products lifetime through maintenance	Prolong products lifetime through repair	Prolong products lifetime through design for durability	**Optimise**	Increase performance/efficiency of products	Customisation/made to order	Reproductible and adaptable manufacturing	Minimize waste in production and supply chain	Increase efficiency of production processes	**Loop**	Remanufacture products and/or components	Implement take-back programs	Recycle materials	Promote the cascade use of wood	Promote extraction of biochemicals from organic waste	
A	Determining the objectives and constraints of the design brief by consulting with clients and stakeholders.			●				●	●	●	●	●		●	●		●			●	●	●	●		
B	Formulating design concepts for industrial, commercial and consumer products.			●				●	●	●	●	●		●	●		●			●	●	●	●		
C	Harmonizing aesthetic considerations with technical, functional, ecological and production requirements.			●				●	●	●	●	●		●	●		●			●	●	●	●		
D	Preparing sketches, diagrams, illustrations, plans, samples and models to communicate design concepts.			●				●	●	●	●	●		●	●		●			●	●	●	●		
E	Negotiating design solutions with clients, management, and sales and manufacturing staff.			●				●	●	●	●	●		●	●					●	●	●	●		
F	Selecting, specifying and recommending functional and aesthetic materials, production methods and finishes for manufacture.			●				●	●	●	●	●		●	●		●	●		●	●	●	●		
G	Detailing and documenting the selected design for production.			●				●	●	●	●	●		●	●	●	●			●	●	●	●		
H	Preparing and commissioning prototypes and samples.			●						●	●	●		●	●	●	●			●	●	●	●		
I	Supervising the preparation of patterns, programmes and tooling, and of the manufacturing process.			●				●	●	●	●	●		●	●	●	●	●		●	●	●	●		

*McKinsey center and Ellen MacArthur Foundation

Tasks changes

Current and forecasted tasks changes due to sector circular economy transition (in green for 2030) and digitalization (in blue for 2025) for the occupational profile: Furniture designer - ISCO 2163s

2025/30
Occupational profile

Description forecast of the occupational profile in 2030

Furniture designers work on items of future furniture and related products exploiting the newest eco-design methods, software and tools and the data and information collected through the highly connected and digitised company ecosystem. They design the product and are involved in its production as craftsmen and designers or makers. The conception of furniture combines innovative design, functional and environmental requirements and aesthetic appeal.

- Uses digitization tools to work in a customer-oriented manner
- Considers cost, environmental impact and time-effectiveness.
- Contributes to continuous improvement of work processes in the company.
- Cooperates with other departments (administrative, commercial, ICT and technical services).
- Assists in the implementation of quality assurance and sustainability activities.
- Applies a life-cycle thinking approach and the ecodesign methodology.
- Uses tools to assess the environmental profile of the designed product (e.g. impact of the materials used in the product, etc.).

Virtualise	Virtualise direct aspects of the product	Virtualise indirect aspects of the product	**Exchange**	Replace old materials with advanced renewable ones	Apply new technologies	Choose new products and services		**Profile tasks forecast**
	●	●		●	●	●	A	Determining the objectives and constraints of the design (including environmental performance) using real life computational simulation models and integrating environmental protection criteria over product's lifecycle, by consulting with clients and stakeholders and aligned with the circular economy-oriented strategies of the organisation.
	●	●		●	●	●	B	Formulating design concepts, based on a life-cycle thinking and circularity approach and using rapid experimentation and digital models, for industrial, commercial and consumer products and services.
	●	●		●	●	●	C	Use virtual models to help harmonizing aesthetic considerations with technical, functional, ecological and production requirements, considering the complete life-cylce of the product, from raw materials selection to end-of-life scenario.
	●	●		●	●	●	D	Make digital (virtual) models and physical samples and models through rapid prototyping to communicate design concepts and the environmental performance of the product, considereing its complete life-cycle.
	●	●		●	●	●	E	Negotiating digital design solutions with clients, management, and sales and manufacturing staff based on the sustainability strategies of the customers and the organisation.
	●	●		●	●	●	F	Selecting, specifying and recommending functional, environmental-friendly and aesthetic materials, ecoefficient production methods and finishes for manufacturing using the highly digitised set of tools and considering the complete life-cycle of the products (e.g. end-of-life scenario).
	●	●		●	●		G	Detailing and documenting the selected circular economy-oriented and digital design for production.
	●	●		●	●		H	Preparing and commissioning physical and digital prototypes, models and samples to assess the technical & environmental performance of the product, prior its launch.
	●	●		●	●		I	Supervising the preparation of patterns, programmes and tooling, and of the digital manufacturing process, to reduce its environmental impimpact, for example energy consumption or waste generation.

Furniture designer
ISCO 2163s

2020
Occupational profile

Current profile description
Furniture designers work on items of furniture and related products. They design the product and are involved in its production as craftsmen and designers or makers. The conception of furniture combines innovative design, functional requirements and aesthetic appeal.
- Works in a customer-oriented manner.
- Considers cost- and time-effectiveness.
- Contributes to continuous improvement of work processes in the company.
- Cooperates with other departments (administrative, commercial and technical services).
- Assists in the implementation of quality assurance activities.

New categorization of hazards

Current profiles tasks	**Mechanical hazards**	Unprotected moving parts[1]	Parts with hazardous shapes (cutting, pointed, rough)	Moving means of transport and tools[2]	Uncontrolled moving parts (flying objects, wood chips)	Slip and trips	Falls from height	**Ergonomic hazards**	Heavy loads/heavy dynamic work	Awkward position/unbalanced strain	Repetitive movements	Lack of exercise, inactivity	**Electrical hazards**	Electric shock	**Hazards due to physical effects/physical agents**	Noise	Vibration	Laserlight	**Fire and explosion hazards**	Flammable substances	**Work environment hazards**	Poor lighting conditions	Climate	Poor ventilation	**Hazards through dangerous substances**	Dust	Solvents (neurotoxic, allergens)	Carcinogens	New materials (e.g. Nanomaterials)	Recycled material	**Biological Hazards**	Non-targeted activities with microorganism	**Psychosocial hazards**	Excessive workloads	Low job satisfaction	Work tasks not clearly defined
A Determining the objectives and constraints of the design brief by consulting with clients and stakeholders.																																				
B Formulating design concepts for industrial, commercial and consumer products.												🟡										🟡	🟡														
C Harmonizing aesthetic considerations with technical, functional, ecological and production requirements.												🟡										🟡	🟡														
D Preparing sketches, diagrams, illustrations, plans, samples and models to communicate design concepts.												🟡										🟡	🟡														
E Negotiating design solutions with clients, management, and sales and manufacturing staff.						🟡																🟡	🟡														
F Selecting, specifying and recommending functional and aesthetic materials, production methods and finishes for manufacture.						🟡																🟡	🟡														
G Detailing and documenting the selected design for production.												🟡										🟡	🟡														
H Preparing and commissioning prototypes and samples.		🟡	🟡			🟡								🟡								🟡	🟡	🟡					🟡	🔴							
I Supervising the preparation of patterns, programmes and tooling, and of the manufacturing process.																						🟡	🟡														

⚪ No changes 🟢 Reduced due to Circular Economy 🔴 New or increased due to Circular Economy 🔵 Reduced due to digitalization 🟡 New or increased due to digitalization

Hazards and risks changes

Current and forecasted tasks changes due to sector circular economy transition (in green for 2030) and digitalization (in blue for 2025) for the occupational profile: Furniture designer - ISCO 2163s

2025/30

Occupational profile

Description forecast of the occupational profile in 2030

Furniture designers work on items of future furniture and related products exploiting the newest eco-design methods, software and tools and the data and information collected through the highly connected and digitised company ecosystem. They design the product and are involved in its production as craftsmen and designers or makers. The conception of furniture combines innovative design, functional and environmental requirements and aesthetic appeal.

- Uses digitization tools to work in a customer-oriented manner
- Considers cost, environmental impact and time-effectiveness.
- Contributes to continuous improvement of work processes in the company.
- Cooperates with other departments (administrative, commercial, ICT and technical services).
- Assists in the implementation of quality assurance and sustainability activities.
- Applies a life-cycle thinking approach and the ecodesign methodology.
- Uses tools to assess the environmental profile of the designed product (e.g. impact of the materials used in the product, etc.).

Poor organisation of work	Poorly designed workplace environment (incl. software)	Repetitive, monotonous work	Cognitive strain	Stress due to long period concentration and awareness	Increased demands on flexibility	Lack of work experience	Lack of involvement in making decisions that affect the worker	Ineffective communication, lack of support from management or colleagues	Working alone/isolation	Workload: overload/underload		**Profile tasks forecast**
●	●		●	●	●	●		●		●	A	Determining the objectives and constraints of the design (including environmental performance) using real life computational simulation models and integrating environmental protection criteria over product's lifecycle, by consulting with clients and stakeholders and aligned with the circular economy-oriented strategies of the organisation.
●	●		●	●	●	●		●	●	●	B	Formulating design concepts, based on a life-cycle thinking and circularity approach and using rapid experimentation and digital models, for industrial, commercial and consumer products and services.
●	●		●	●	●	●		●	●	●	C	Use virtual models to help harmonizing aesthetic considerations with technical, functional, ecological and production requirements, considering the complete life-cylce of the product, from raw materials selection to end-of-life scenario.
●	●		●	●	●	●		●		●	D	Make digital (virtual) models and physical samples and models through rapid prototyping to communicate design concepts and the environmental performance of the product, considereing its complete life-cycle.
●	●		●	●	●	●		●		●	E	Negotiating digital design solutions with clients, management, and sales and manufacturing staff based on the sustainability strategies of the customers and the organisation.
●	●		●	●	●	●		●		●	F	Selecting, specifying and recommending functional, environmental-friendly and aesthetic materials, ecoefficient production methods and finishes for manufacturing using the highly digitised set of tools and considering the complete life-cycle of the products (e.g. end-of-life scenario).
●	●		●	●	●	●		●	●	●	G	Detailing and documenting the selected circular economy-oriented and digital design for production.
●	●		●	●	●	●		●		●	H	Preparing and commissioning physical and digital prototypes, models and samples to assess the technical & environmental performance of the product, prior its launch.
●	●		●	●	●	●		●		●	I	Supervising the preparation of patterns, programmes and tooling, and of the digital manufacturing process, to reduce its environmental impact, for example energy consumption or waste generation.

1 Cobotics (Squeezing, bumping, crushing, cutting, amputation, drawing-in/trapping).
2 Run over, roll over, falls from height.

Hazards and risks changes

Current and forecasted risks changes due to sector circular economy transition (in green for 2030) and digitalization (in blue for 2025) for the occupational profile: Furniture designer – ISCO 2163s

2020 Current situation	2025-30 Situation forecast
Work area: office workplace, computer workplace, meeting room, sales rooms, discussion with difficult clients, managers and manufacturing staff, workshop for preparing prototypes and patterns.	Work area: office workplace, computer workplace, meeting room, sales rooms, discussion with difficult clients, managers and manufacturing staff, workshop for preparing prototypes and patterns, use of complex software, use of digitalized tools. Taking into consideration design of sustainable products made from e.g. recycled materials with energy saving processes.
Mechanical hazards	
• Mechanical hazards: (when working in workshops to prepare prototypes): from moving machines and tools. **Effects**: bruises, cuts and sharp injuries, crushing.	• Mechanical hazards: (when working in workshops to prepare prototypes): from moving machines and tools. **Effects**: bruises, cuts and sharp injuries, crushing.
• Slips and trips, obstacles, table edges, moving vehicles, machines. **Effects**: squeezing, cutting, twisting, spraining, bumps and bruises.	• Slips and trips, obstacles, table edges, moving vehicles, machines. **Effects**: squeezing, cutting, twisting, spraining, bumps and bruises.
Ergonomic hazards	
• Ergonomic hazards: from poor ergonomic conditions and inactivity, prolonged sitting and from poor ergonomic practices with mobile devices. **Effects**: chronic neck and back pain, obesity and cardiovascular diseases.	• Ergonomic hazards: from poor ergonomic conditions and inactivity, prolonged sitting and from poor ergonomic practices with mobile devices. Digitalization put workers at risk of being exposed to ergonomic hazards such as lack of exercise/inactivity because of operating autonomous or semi-autonomous machines from office workstations. Inactivity may increase with further digitalization. **Effects**: chronic neck and back pain, obesity and cardiovascular diseases.
Electrical hazards	
• Electrical hazards: contacts with live parts or connections or exposure to arc flash. **Effect**: fatal accident.	• Electrical hazards: contacts with live parts or connections or exposure to arc flash. **Effect**: fatal accident.
Work environmental hazards	
• Work environmental hazards: software not appropriate, poor lighting and inappropriate indoor air quality and temperature. **Effects**: eyestrain, headache, colds, cardiovascular problems.	• Work environmental hazards: software not appropriate, poor lighting and inappropriate indoor air quality and temperature. **Effects**: eyestrain, headache, colds, cardiovascular problems.
Hazards through dangerous substances	
	• Experiments and work with new materials and with recycled materials. **Effects**: not yet well known, included are among others skin diseases, respiratory diseases, cancer.
Psychosocial hazards	
• Organisation of work/content of work: tight deadlines, performance pressure, high expectations regarding creativity, difficult negotiations, no clear distinction between private life and work life, overload, lack of training and information.	• Organisation of work/content of work: tight deadlines, performance pressure, high expectations regarding creativity, difficult negotiations, no clear distinction between private life and work life, overload, lack of training and information. Increased demand on competences and up-to-date knowledge on the current development in circular economy and recycling industry.
• Social relationship: difficult clients, difficult colleagues.	• Social relationship: difficult clients, difficult colleagues.
• Working method: working alone frequently, cooperation with other departments.	• Working method: working alone frequently, cooperation with other departments; digitalization may increase long period of concentration working with computer and new software and performing multitasking, increased demand on flexibility as workers may work from everywhere with mobile devices. Increased demand on knowledge regarding the design of sustainable products respecting circular economy. Workers are also at risk of being permanent available outside working hours. • Lack of work experience: new software and digital devices require training, some workers may not have enough competences and may feel overloaded, not experienced enough. Deciding on circular economic and sustainable oriented strategies/products: increased demand on skills and knowledge/keeping up-to-date regarding the current development in circular economy and sustainable oriented strategies/products (staying up-to-date; further training for new technologies and processes). • Workers are at risk of cognitive strain due to interactions between digitalized instruments and autonomous technologies. The use of cobots and other digital techniques may increase the risk of working alone and feeling isolated. Working in a customer-oriented manner requires an increased flexibility.
Effects: stress, burnout and emotional distress, suffering from depression, cardiovascular problems, sleep disorders.	**Effects**: stress, burnout and emotional distress, suffering from depression, cardiovascular problems, sleep disorders.

Skills and competences needs

Forecast of training new needs due to sector circular economy transition (in green for 2030) and digitalization (in blue for 2025) for the occupational profile: Furniture designer – ISCO 2163s

Skills, knowledge and competences	Will it continue to be needed?	Main causes/reasons of change: Shift to renewable materials	Prolong products lifetime through maintenance	Prolong products lifetime through repair	Prolong products lifetime through design for durability	Increase performance/efficiency of products	Customisation/made to order	Remanufacture products and/or components	Implement Take Back programs	Recycle materials	Promote the cascade use of wood	Virtualise direct aspects of the product	Virtualise indirect aspects of the product	Replace old materials with advanced renewable ones	Apply new technologies	Exploiting the newest design methods, software and tools and the data and information collected through the highly connected and digitized company ecosystem	Use digitization tools to work in a customer-oriented manner	Using real life computational simulation models	Using rapid experimentation / rapid prototyping and digital/virtual models	Digital design
Essential skills and competences																				
Adapt to new design materials	YES																			
Attend design meetings	YES, changed															●	●	●	●	●
Consult with design team	YES, changed															●		●	●	
Design original furniture	YES, changed															●	●	●	●	●
Develop design concept	YES, changed	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●			●
Gather reference materials for artwork	NO																			
Monitor art scene developments	YES																			
Monitor exhibition designs	YES																			
Monitor sociological trends	YES, changed	●	●	●	●	●	●	●	●	●	●	●	●	●	●					
Monitor textile manufacturing developments	YES																			
Present detailed design proposals	YES, changed						●				●	●	●		●			●	●	
Transfer designs	YES, changed	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	
Essential knowledge																				
Art history	YES																			
Aesthetics	YES																			
Copyright legislation	YES																			
Design principles	YES, changed	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Engineering principles	YES, changed		●	●	●	●		●				●	●		●	●		●	●	
Engineering processes	YES, changed	●						●	●	●				●	●					
Ergonomics	YES																			
Industrial design	YES, changed	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●	●
Manufacturing processes	YES, changed	●						●	●	●				●	●			●	●	
Mathematics	NO																			
Generic green skills, knowledge and competences (*)																				
Environmental awareness and willingness to learn	NEW	●	●	●	●	●	●		●	●	●	●								
Systems and risk analysis skills	NA																			
Innovation skills	NEW	●	●	●	●	●		●		●		●	●	●	●					
Coordination, management and business skills	NEW	●				●	●		●	●	●			●	●					
Communication and negotiation skills	NEW	●				●	●		●	●	●	●	●	●	●					
Marketing skills	NEW	●					●		●		●	●	●		●					
Strategic and leadership skills	NA																			
Consulting skills	NEW	●				●	●		●	●	●	●	●	●	●					
Networking, information technology and language skills	NEW	●	●	●	●	●		●		●		●	●	●	●					
Adaptability and transferability skills	NEW	●	●	●	●	●	●	●	●		●			●	●					
Entrepreneurial skills	NEW	●	●	●	●	●		●		●		●	●	●	●					
Waste, energy and water quantification and monitoring	NEW	●				●		●	●	●	●		●	●	●					
Material use and impact quantification and monitoring	NEW	●				●		●	●	●	●		●	●	●					
Material use and impact minimisation	NEW	●	●	●	●	●		●	●	●	●		●	●	●					

(*) Source: Strietskallina et al. and Dr. Margarita Pavlova

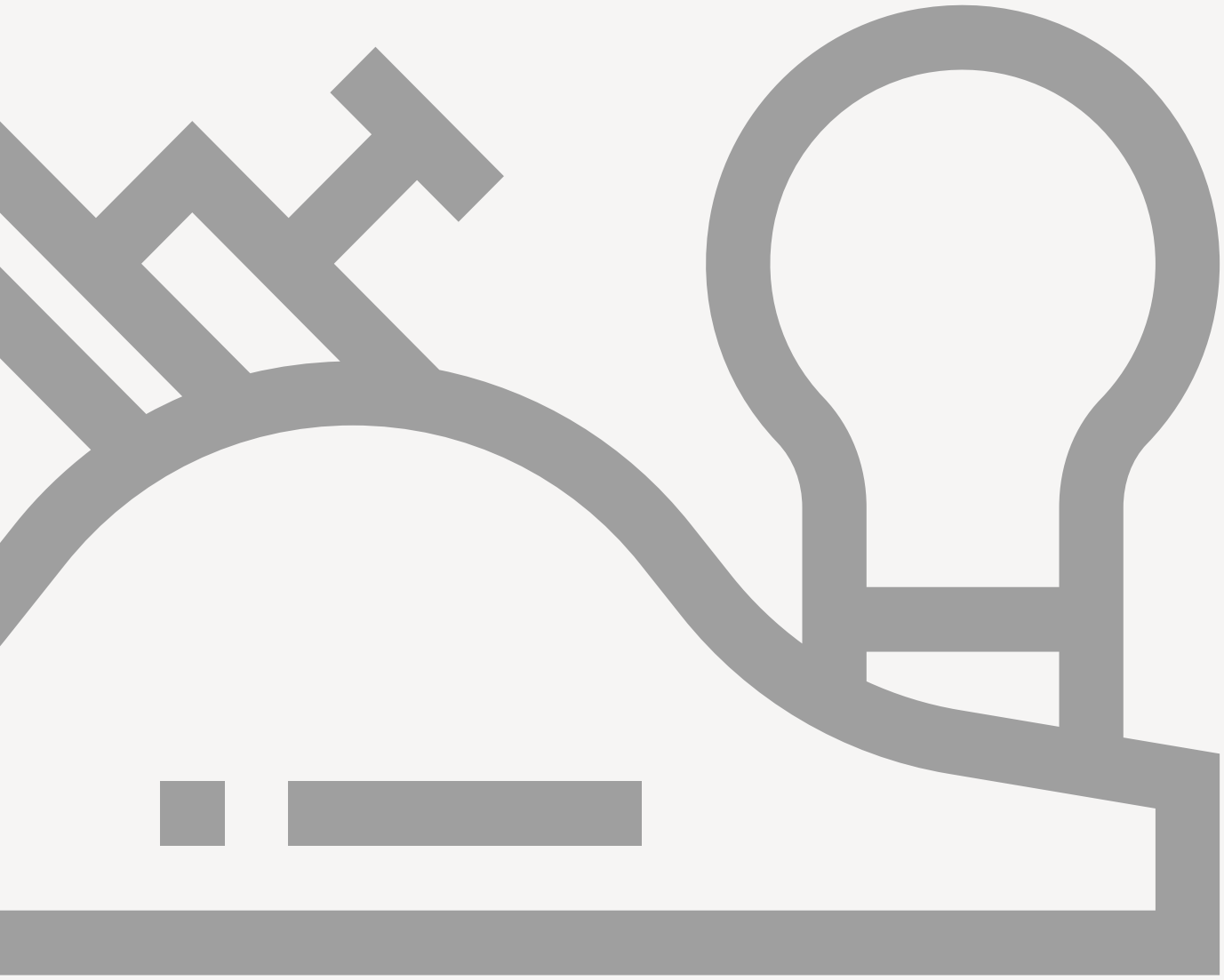
Cabinet-maker and related workers
ISCO 7522

You will find three different types of tables for each occupational profile, where the forecasted changes due to sector circular economy transition are in green colour and due to sector digitalization are in blue colour.

Tasks changes
Current and forecasted tasks changes.

Hazards and risks changes
Current and forecasted risks changes.

Skills and competences need
Forecast of training new needs.



Cabinet-maker and related workers
ISCO 7522

Unfold this to see the current occupational profile description and its tasks and to relate them to the following green table and first yellow table.

Tasks changes

Hazards and risks changes

Hazards and risks comments

Skills and competences needs

КЪМ ИНДЕКС

Cabinet-maker and related workers ISCO 7522

2020

Occupational profile

Current profile description

Cabinet-makers and related workers make, decorate and repair wooden furniture, carts and other vehicles, wheels, parts, fittings, patterns, models and other wooden products using woodworking machines, machine tools and specialized hand tools.

- Works in accordance with basic health and safety regulations, including environmental protection and efficient energy use.
- Works in a customer-oriented manner.
- Considers cost- and time-effectiveness when planning and organizing his/her work in his/her area of influence.
- Contributes to continuous improvement of work processes in the company.
- Coordinates work with the rest of the team, report to his/her team leader.
- Cooperates with other departments (administrative, commercial and technical services).
- Assists in the implementation of quality assurance activities.

Current profiles tasks		ReSOLVE levers*																								
		Regenerate	Shift to renewable energies	Shift to renewable materials	Reclaim, retain, and regenerate health of ecosystems	Return recovered biological resources to the biosphere	**Share**	Reduce product replacement speed and increase product utilisation by sharing it among different users	Reuse products throughout their technical lifetime	Prolong products lifetime through maintenance	Prolong products lifetime through repair	Prolong products lifetime through design for durability	**Optimise**	Increase performance/efficiency of products	Customisation/made to order	Reproductible and adaptable manufacturing	Minimize waste in production and supply chain	Increase efficiency of production processes	**Loop**	Remanufacture products and/or components	Implement take-back programs	Recycle materials	Promote the cascade use of wood	Promote extraction of biochemicals from organic waste		
A	Operating woodworking machines such as power saws, jointers, mortisers and shapers, and using hand tools to cut, shape and form parts and components. - Selecting, controlling, mounting and replacement of cutting tools on the woodworking machines. - Operating woodworking machines.			●						●	●	●		●	●	●	●	●		●		●	●			
B	Studying plans, verifying dimensions of articles to be made, or preparing specifications and checking the quality and fit of pieces in order to ensure adherence to specifications.			●					●	●	●	●		●	●	●	●	●		●		●	●			
C	Trimming joints and fitting parts and subassemblies together to form complete units using glue and clamps, and reinforcing joints using nails, screws or other fasteners.			●					●	●	●	●		●	●	●	●	●		●		●	●			
D	Making, restyling and repairing various wooden articles such as cabinets, furniture, vehicles, scale models, sports equipment and other parts or products.			●					●	●	●	●		●	●	●	●	●		●	●	●	●			
E	Decorating furniture and fixtures by inlaying wood or applying veneer and carving designs.			●					●		●	●		●	●	●	●	●		●	●	●				
F	Finishing surfaces of wooden articles or furniture.			●						●	●	●		●	●	●	●	●				●				
G				●				●						●		●	●				●	●	●	●		
H				●				●	●	●	●	●		●	●	●	●	●		●	●	●	●			

*McKinsey center and Ellen MacArthur Foundation

Tasks changes

Current and forecasted tasks changes due to sector circular economy transition (in green for 2030) and digitalization (in blue for 2025) for the occupational profile: Cabinet-maker and related workers - ISCO 7522

2025/30

Occupational profile

Description forecast of the occupational profile in 2030

Cabinet-makers and related workers make, decorate and repair wooden furniture, carts and other vehicles, wheels, parts, fittings, patterns, models and other wooden products using highly digitized, connected, ecoefficient and automated woodworking machines and machine tools as well as specialized hand tools.

- Works in accordance with basic health and safety regulations, including environmental protection and efficient energy use.
- Uses digitization tools to work in a customer-oriented manner.
- Considers cost, environmental impact and time-effectiveness when planning and organizing his/her work in his/her area of influence.
- Contributes to continuous improvement of work processes in the company.
- Coordinates work with the rest of the team, report to his/her team leader.
- Cooperates with other departments (administrative, commercial, ICT and technical services).
- Assists in the implementation of quality assurance and sustainability activities.
- Assists in the reduction of the environmental impact of the manufacturing, repair, remanufacturing or recycling processes (e.g. waste generation or energy use reduction, etc.).
- Applies a life-cycle thinking and favour the future disassembly of the product for maintenance, repair, reuse or recycling.

	Virtualise	Virtualise direct aspects of the product	Virtualise indirect aspects of the product	**Exchange**	Replace old materials with advanced renewable ones	Apply new technologies	Choose new products and services	**Profile tasks forecast**
A					●	●		Operating connected, digitized, ecoefficient and highly automated, even autonomous woodworking machines, such as power saws, jointers, mortisers and shapers, and using hand tools to cut, shape and form parts and components. • Selecting, controlling, mounting and replacement of cutting tools on the woodworking machines. • Operating connected, digitized, ecoefficient and highly automated woodworking machines. • Optimising the use of resources and energy and reducing to maximum the generated waste (e.g. wood scrap).
B			●		●	●		Simulating, using digital twins, to study and optimise plans, verifying dimensions of articles to be made, or preparing specifications and checking the quality and fit of pieces in order to ensure adherence to technical & environmental specifications, including product durability, reparability, etc.
C			●			●		With the help of cobots trim joints and fit parts and subassemblies together to autonomously form complete units using glue and clamps, and reinforcing joints using nails, screws or other fasteners, considering the future disassembly needs and potential reparability of the product (e.g. reducing glued components, etc.).
D		●	●		●	●	●	Through human-robot collaboration make, restyle and repair various wooden articles such as cabinets, furniture, vehicles, scale models, sports equipment and other parts or products, in line with the circular economy-oriented strategies of the organisation (e.g. increase product durability).
E		●	●		●	●	●	Create environmental-friendly designs, using digital simulation tools like digital twins and augmented reality, and decorate furniture and fixtures by inlaying wood or applying veneer and carving designs with the use of automated and ecoefficient machines such as laser-cutting cobots and other human-robot collaboration, using sustainable materials and taking into account future disassembling and whole product life cycle.
F					●	●		Finishing surfaces of wooden articles or furniture using non-hazardous substances (e.g. low-VOCs chemicals) through highly automated, even autonomous machines, cobots and robots, that can be remotely operated (with the help of Augmented Reality) using big data.
G					●			Selective and/or destructive disassembling of out of use or defective wood-based furniture products for separation of materials and elements for further recovery or recycling.
H					●	●	●	Operating tools and highly digitized, connected and automated woodworking machines for the maintenance, reparation and/or re-manufacturing of wood-based furniture products, including cleaning, polishing and/or additional finishing treatments.

Cabinet-maker and related workers ISCO 7522

2020

Occupational profile

Current profile description

Cabinet-makers and related workers make, decorate and repair wooden furniture, carts and other vehicles, wheels, parts, fittings, patterns, models and other wooden products using woodworking machines, machine tools and specialized hand tools.

- Works in accordance with basic health and safety regulations, including environmental protection and efficient energy use.
- Works in a customer-oriented manner.
- Considers cost- and time-effectiveness when planning and organizing his/her work in his/her area of influence.
- Contributes to continuous improvement of work processes in the company.
- Coordinates work with the rest of the team, report to his/her team leader.
- Cooperates with other departments (administrative, commercial and technical services).
- Assists in the implementation of quality assurance activities.

Current profiles tasks

A	Operating woodworking machines such as power saws, jointers, mortisers and shapers, and using hand tools to cut, shape and form parts and components. - Selecting, controlling, mounting and replacement of cutting tools on the woodworking machines. - Operating woodworking machines.
B	Studying plans, verifying dimensions of articles to be made, or preparing specifications and checking the quality and fit of pieces in order to ensure adherence to specifications.
C	Trimming joints and fitting parts and subassemblies together to form complete units using glue and clamps, and reinforcing joints using nails, screws or other fasteners.
D	Making, restyling and repairing various wooden articles such as cabinets, furniture, vehicles, scale models, sports equipment and other parts or products.
E	Decorating furniture and fixtures by inlaying wood or applying veneer and carving designs.
F	Finishing surfaces of wooden articles or furniture.
G	
H	

New categorization of hazards

No changes · Reduced due to Circular Economy · New or increased due to Circular Economy · Reduced due to digitalization · New or increased due to digitalization

Hazards and risks changes

Current and forecasted tasks changes due to sector circular economy transition (in green for 2030) and digitalization (in blue for 2025) for the occupational profile: Cabinet-maker and related workers - ISCO 7522

2025/30

Occupational profile

Description forecast of the occupational profile in 2030

Cabinet-makers and related workers make, decorate and repair wooden furniture, carts and other vehicles, wheels, parts, fittings, patterns, models and other wooden products using highly digitized, connected, ecoefficient and automated woodworking machines and machine tools as well as specialized hand tools.

- Works in accordance with basic health and safety regulations, including environmental protection and efficient energy use.
- Uses digitization tools to work in a customer-oriented manner.
- Considers cost, environmental impact and time-effectiveness when planning and organizing his/her work in his/her area of influence.
- Contributes to continuous improvement of work processes in the company.
- Coordinates work with the rest of the team, report to his/her team leader.
- Cooperates with other departments (administrative, commercial, ICT and technical services).
- Assists in the implementation of quality assurance and sustainability activities.
- Assists in the reduction of the environmental impact of the manufacturing, repair, remanufacturing or recycling processes (e.g. waste generation or energy use reduction, etc.).
- Applies a life-cycle thinking and favour the future disassembly of the product for maintenance, repair, reuse or recycling.

	Poor organisation of work	Poorly designed workplace environment (incl. software)	Repetitive, monotonous work	Cognitive strain	Stress due to long period concentration and awareness	Increased demands on flexibility	Lack of work experience	Lack of involvement in making decisions that affect the worker	Ineffective communication, lack of support from management or colleagues	Working alone/isolation	Workload: overload/underload	**Profile tasks forecast**
A	●	●		●	●	●	●	●	●	●	●	Operating connected, digitized, ecoefficient and highly automated, even autonomous woodworking machines, such as power saws, jointers, mortisers and shapers, and using hand tools to cut, shape and form parts and components. • Selecting, controlling, mounting and replacement of cutting tools on the woodworking machines. • Operating connected, digitized, ecoefficient and highly automated woodworking machines. • Optimising the use of resources and energy and reducing to maximum the generated waste (e.g. wood scrap).
B	●	●		●	●	●	●	●	●	●	●	Simulating, using digital twins, to study and optimise plans, verifying dimensions of articles to be made, or preparing specifications and checking the quality and fit of pieces in order to ensure adherence to technical & environmental specifications, including product durability, reparability, etc.
C	●	●	●	●	●	●	●	●	●	●	●	With the help of cobots trim joints and fit parts and subassemblies together to autonomously form complete units using glue and clamps, and reinforcing joints using nails, screws or other fasteners, considering the future disassembly needs and potential reparability of the product (e.g. reducing glued components, etc.).
D	●	●		●	●	●	●	●	●	●	●	Through human-robot collaboration make, restyle and repair various wooden articles such as cabinets, furniture, vehicles, scale models, sports equipment and other parts or products, in line with the circular economy-oriented strategies of the organisation (e.g. increase product durability).
E	●	●		●	●	●	●	●	●	●	●	Create environmental-friendly designs, using digital simulation tools like digital twins and augmented reality, and decorate furniture and fixtures by inlaying wood or applying veneer and carving designs with the use of automated and ecoefficient machines such as laser-cutting cobots and other human-robot collaboration, using sustainable materials and taking into account future disassembling and whole product life cycle.
F	●	●		●	●	●	●	●	●	●	●	Finishing surfaces of wooden articles or furniture using non-hazardous substances (e.g. low-VOCs chemicals) through highly automated, even autonomous machines, cobots and robots, that can be remotely operated (with the help of Augmented Reality) using big data.
G	●	●				●	●	●	●		●	Selective and/or destructive disassembling of out of use or defective wood-based furniture products for separation of materials and elements for further recovery or recycling.
H	●	●				●	●	●	●		●	Operating tools and highly digitized, connected and automated woodworking machines for the maintenance, reparation and/or re-manufacturing of wood-based furniture products, including cleaning, polishing and/or additional finishing treatments.

1 Cobotics (Squeezing, bumping, crushing, cutting, amputation, drawing-in/trapping).
2 Run over, roll over, falls from height.

Hazards and risks changes

Current and forecasted risks changes due to sector circular economy transition (in green for 2030) and digitalization (in blue for 2025) for the occupational profile: Cabinet-maker and related workers - ISCO 7522

2020 Current situation	2025-30 Situation forecast
Work area: workshops with wood processing machines, hand and power tools such as (sanders, circular/crosscut/ripsaws), wood storage, finishing of wood products.	Work area: workshops with wood processing machines, hand and power tools such as (sanders, circular/crosscut/ripsaws), wood storage, storage of new and recycled materials, finishing of wood products, use of digitalized tools, disassembly, dismantling, repair, reuse, maintenance and remanufacturing of furniture.
Mechanical hazards	
• Mechanical hazards from moving machines and tools. Woodworking machinery exposes workers to risks of being injured by unprotected moving parts, contact with moving blades (saw blade, drill, kick back etc), uncontrolled moving parts (flying objects, wood chips) and parts with hazardous shapes (cutting, pointed, rough).	• Mechanical hazards from moving machines and tools and from cobots and robots. Woodworking machinery exposes workers to risks of being injured by unprotected moving parts, contact with moving blades (saw blade, drill, kick back etc), uncontrolled moving parts (flying objects, wood chips) and parts with hazardous shapes (cutting, pointed, rough). Some risks from mechanical hazards may decrease, depending on takeover of specific tasks by cobots/robots. Most of industrial cobots and robots are unaware of their surroundings therefore they can be dangerous to workers. Industrial robots can pose several types of hazards based on their origin: Mechanical hazards such as those arising from unintended and unexpected movements or release of tools. Remanufacturing and selective disassembling could require new type of tools not available. Better design of products (ecodesign) could reduce hazards associated to assembly/ disassembly operations, using optimised joining systems, etc.
Effects: severe bruises, amputations, cuts and sharp injuries, crushing.	**Effects**: severe bruises, amputations, cuts and sharp injuries, crushing.
• Slips and trips, obstacles, table edges, moving vehicles, machines.	• Slips and trips, obstacles, table edges, moving vehicles, machines.
Effects: squeezing, cutting, twisting, spraining, bumps and bruises.	**Effects**: squeezing, cutting, twisting, spraining, bumps and bruises.
Ergonomic hazards	
• Ergonomic hazards: poor ergonomic conditions, heavy physical workload.	• Ergonomic hazards: poor ergonomic conditions, heavy physical workload. Risks from ergonomic hazards may decrease, depending on take over of specific tasks by cobots/robots. On the other hand, workers are increasingly exposed to ergonomic hazards such as lack of exercise/inactivity because of operating autonomous machines and cobots from computer workstations. Maintenance, remanufacturing and repair services as well as dismantling of manufactured goods may be related to Musculoskeletal Disorders (MSDs) (e.g. awkward positions, heavy lifting and carrying). This risk could be reduced with ecodesign strategies to facilitate assembly/disassembly (e.g. type of fasteners, etc.) if occupational safety and health is taken into account when designing the product.
Effect: musculoskeletal diseases.	**Effect**: musculoskeletal diseases.
Electrical hazards	
• Electrical hazards: contacts with live parts or connections or exposure to arc flash. Electrical hazards from woodworking machines.	• Electrical hazards: contacts with live parts or connections or exposure to arc flash. Electrical hazards from woodworking machines and from autonomous or highly autonomous equipment.
Effect: fatal accident.	**Effect**: fatal accident.
Hazards due to physical effects/physical agents	
• Noise	• Noise: exposure to noise may decrease, depending on takeover of specific tasks by cobots/robots. Noise maybe reduced due to ecodesign of machinery operating quieter and more environmental-friendly. However, dismantling activities may expose workers still to noise.
Effects: hearing loss, headache, nervousness, poor concentration.	**Effects**: hearing loss, headache, nervousness, poor concentration.
• Vibrations	• Vibrations: exposure to vibration may decrease, depending on takeover of specific tasks by cobots/robots. Possible more use of vibrating tools during dismantling, product remanufacturing or repair (polisher, etc.). Vibration maybe reduced due to ecodesign of machinery operating with less vibration energy and more environmental-friendly.
Effects: hand-arm-vibration syndrome (e.g. white finger disease).	**Effects**: hand-arm-vibration syndrome (e.g. white finger disease).
• Laserlight	• Laserlight: cabinet makers may be exposed to laserlight.
Effects: eye damage, negative effects similar to sunburn.	**Effects**: eye damage, negative effects similar to sunburn.
Fire and explosion hazards	
• Fire and explosion hazards from materials, including wood dust, solvents and chemicals.	• Fire and explosion hazards from materials, including wood dust, solvents and chemicals. Exposure to fire and explosion hazards may decrease, depending on takeover of specific tasks by cobots/robots. Dust maybe emitted during dismantling, remanufacturing or repair activities– inappropriate dust extraction system increases risk of dust explosion. Risk from explosion and fire may decrease, depending on the substitution of flammable solvents in glues.
Effects: burns, fatal accidents.	**Effects**: burns, fatal accidents.

2020 Current situation	2025-30 Situation forecast
Work environmental hazards	
• Work environmental hazards: poor lighting, climate and temperature.	• Work environmental hazards: poor lighting, inadequate temperature and climate, poor ventilation.
Effects: negative effects on muscles, tendons and joints, cold, poor concentration, eye strain, headache.	**Effects**: negative effects on muscles, tendons and joints, cold, poor concentration, eye strain, headache.
Hazards through dangerous substances	
• Chemical hazards/ dangerous substances: asbestos, glass fibre, vapours, fumes, dust, solvents, new materials (nanomaterials).	• Chemical hazards/dangerous substances: asbestos, glass fibre, vapours, fumes, dust, solvents, new materials (nanomaterials). The risk of being exposed to chemicals may decrease, depending on takeover of specific tasks by cobots/robots. Chemical hazards may be reduced, if OSH will be included in the design of the products/ materials (use of less dangerous substances) and if dangerous substances will be substituted by less dangerous substances (solvents, glues, formaldehyde). Disassembling, dismantling: Exposure to fibres or dust when disassembling, dismantling products.
Effects: contamination/intoxication, skin diseases, respiratory diseases, cancer.	**Effects**: contamination/intoxication, skin diseases, respiratory diseases, cancer.
	• New materials (e.g. nanomaterials): Nanotechnology and nanomaterials may be used in woods as well as wood-composite materials in order to improve some of their properties, e.g. to improve the water resistance or thermal conductivity. Effects: not yet well known, included are among others inflammation and tissue damage, fibrosis and tumour generation.
	• Recycled material: Risk of exposure to dangerous substances may be increased through lack of information on chemicals contained in recycled products and on ways how to deal with them appropriately. Recycled material may contain dangerous substances, to the latest findings carcinogen or repro-toxic. (nowadays restricted by law (REACH)). **Effects**: contamination/intoxication, skin diseases, respiratory diseases, cancer.
Biological hazards	
• Biological hazards: bacteria, mould and fungi.	• Non-targeted activities with microorganism: selective and/or destructive disassembling for separation of materials and elements for further recovery or recycling may expose workers to microorganism such as mould (Recycled, old and used material may contain mould).
Effects: contamination/intoxication, skin diseases, respiratory diseases, infections.	**Effects**: contamination/intoxication, skin diseases, respiratory diseases, infections.
Psychosocial hazards	
• Organisation of work: time pressure, shift work, stress, often related to poor work organisation lack of training.	• Organisation of work: time pressure, shift work, stress, often related to poor work organisation lack of training, increased demand on flexibility and digital know how, repetitive and monotonous work. Lack of experience: New software and digital devices require training, some workers may not have enough competences and may feel overloaded, not experienced enough. Increased demand on competences and up-to-date knowledge on the current development in circular economy and recycling industry. Working with materials which have previously been manufactured: new skills need to be acquired throughout the production cycle. Repair, remanufacture and selective disassembly require new methods and procedures.
• Social relationship: lack of involvement in making decisions that affect the worker, difficult colleagues.	• Social relationship: lack of involvement in making decisions that affect the worker, difficult colleagues, lack of social contacts.
• Working method: operating woodworking machines, working with colleagues.	• Working method: working with colleagues, operating digital equipment, cognitive interactions with autonomous technologies. The use of cobots and other digital technologies may increase the risk of working alone and feeling isolated. Cognitive interactions between a robot and a human worker can lead to mental stress. Long period of concentration working with computer and new software and performing multitasking, increased demand on flexibility as workers may work from everywhere with mobile devices. Workers are also at risk of being permanent available outside working hours.
Effects: stress, burnout and emotional distress, suffering from depression, cardiovascular problems, sleep disorders.	**Effects**: stress, burnout and emotional distress, suffering from depression, cardiovascular problems, sleep disorders.

Skills and competences needs

Forecast of training new needs due to sector circular economy transition (in green for 2030) and digitalization (in blue for 2025) for the occupational profile: Cabinet-maker and related workers - ISCO 7522

Skills, knowledge and competences	Will it continue to be needed?	Main causes/reasons of change: Shift to renewable materials	Increase performance/efficiency of products	Reproductible and adaptable manufacturing	Minimize waste in production and supply chain	Remanufacture products and/or components	Recycle materials	Promote the cascade use of wood	Apply new technologies	Use digitization tools to work in a customer-oriented manner	Using highly digitized, connected and automated (autonomous) woodworking machines	Simulation and use of digital twins to study and optimize	Human-robot collaboration, use of cobots, that can be remotely operated (with the help of Augmented Reality) using big data	Create designs, using digital simulation tools like digital twins and augmented reality
Essential skills and competences														
Apply a protective layer	YES, changed	●	●		●	●			●		●		●	
Apply wood finishes	YES, changed	●	●		●	●			●		●		●	
Clean wood surface	YES, changed					●	●	●	●		●		●	
Create furniture frames	YES, changed		●	●		●	●	●	●		●		●	
Create smooth wood surface	YES, changed										●		●	
Design objects to be crafted	YES, changed	●			●	●	●	●	●			●		●
Design original furniture	YES, changed	●				●	●	●	●			●		●
Join wood elements	YES, changed	●	●	●		●	●	●	●		●		●	
Operate drilling equipment	YES, changed		●	●		●			●		●		●	
Operate wood sawing equipment	YES, changed		●	●		●			●		●		●	
Repair furniture frames	YES, changed	●	●	●	●	●	●	●	●		●		●	
Sand wood	YES, changed					●	●	●	●		●		●	
Tend boring machine	YES, changed		●	●		●			●		●		●	
Disassemble wood-based furniture products	NEW	●	●	●	●	●	●	●	●		●		●	
Examine disassembled pieces for further steps (reuse, recylce, upcycle)	NEW	●	●	●	●	●	●	●	●		●		●	
Repair wood-based furniture pieces, where needed	NEW	●	●	●	●	●	●	●	●		●		●	
Essential knowledge														
Construction products	YES, changed	●	●	●	●	●	●	●	●	●		●		●
Furniture trends	YES, changed	●	●	●		●	●	●	●	●		●		
Sanding techniques	YES, changed					●	●		●		●		●	
Technical drawings	YES, changed	●	●	●		●	●		●	●		●		●
Types of wood	YES, changed	●	●		●	●	●	●	●					
Wood products	YES, changed	●	●		●	●	●	●	●					
Woodturning	YES, changed		●	●		●			●		●		●	
Generic green skills, knowledge and competences (*)														
Environmental awareness and willingness to learn	NEW		●	●		●	●	●	●					
Systems and risk analysis skills	NA													
Innovation skills	NEW	●	●	●		●		●	●					
Coordination, management and business skills	NA													
Communication and negotiation skills	NEW	●						●						
Marketing skills	NA													
Strategic and leadership skills	NA													
Consulting skills	NEW	●	●	●	●			●						
Networking, information technology and language skills	NA													
Adaptability and transferability skills	NEW	●	●	●		●	●	●	●					
Entrepreneurial skills	NA													
Waste, energy and water quantification and monitoring	NEW	●	●	●	●	●	●	●	●					
Material use and impact quantification and monitoring	NEW	●	●	●	●	●	●	●	●					
Material use and impact minimisation	NEW	●	●		●	●	●	●	●					

(*) Source: Strietskallina et al. and Dr. Margarita Pavlova

Woodworking-machine tool setter and operator
ISCO 7523

You will find three different types of tables for each occupational profile, where the forecasted changes due to sector circular economy transition are in green colour and due to sector digitalization are in blue colour.

Tasks changes
Current and forecasted tasks changes.

Hazards and risks changes
Current and forecasted risks changes.

Skills and competences need
Forecast of training new needs.

Woodworking-machine tool setter and operator
ISCO 7523

Unfold this to see the current occupational profile description and its tasks and to relate them to the following green table and first yellow table.

Tasks changes

Hazards and risks changes

Hazards and risks comments

Skills and competences needs

КЪМ ИНДЕКС

Woodworking-machine tool setter and operator ISCO 7523

2020
Occupational profile

Current profile description
Woodworking machine tool setters and operators set-up, operate and monitor automatic or semi-automatic woodworking machines such as precision sawing, shaping, planing, boring, turning and woodcarving machines to fabricate or repair wooden parts for furniture, fixtures and other wooden products.

- Works in accordance with basic health and safety regulations, including environmental protection and efficient energy use.
- Works in a customer-oriented manner.
- Considers cost- and time-effectiveness when planning and organizing his/her work in his/her area of influence.
- Contributes to continuous improvement of work processes in the company.
- Coordinates work with the rest of the team, report to his/her team leader.
- Cooperates with other departments (administrative, commercial and technical services).
- Assists in the implementation of quality assurance activities.

Current profiles tasks		ReSOLVE levers*																								
		Regenerate	Shift to renewable energies	Shift to renewable materials	Reclaim, retain, and regenerate health of ecosystems	Return recovered biological resources to the biosphere	**Share**	Reduce product replacement speed and increase product utilisation by sharing it among different users	Reuse products throughout their technical lifetime	Prolong products lifetime through maintenance	Prolong products lifetime through repair	Prolong products lifetime through design for durability	**Optimise**	Increase performance/efficiency of products	Customisation/made to order	Reproductible and adaptable manufacturing	Minimize waste in production and supply chain	Increase efficiency of production processes	**Loop**	Remanufacture products and/or components	Implement take-back programs	Recycle materials	Promote the cascade use of wood	Promote extraction of biochemicals from organic waste		
A	Verifying dimensions of articles to be made, or preparing specifications and checking the quality and fit of pieces in order to ensure adherence to specifications.			●					●		●	●		●	●	●	●	●		●		●	●			
B	Setting up, programming, operating and monitoring several types of woodworking machines for sawing, shaping, boring, drilling, planing, pressing, turning, sanding or carving to fabricate or repair wooden parts for furniture, fixtures and other wooden products.														●	●	●	●		●			●			
C	Operating preset special-purpose wood-working machines to fabricate wooden products such as coat hangers, mop handles, clothespins and other products.			●					●		●	●		●	●	●	●	●		●		●	●			
D	Selecting knives, saws, blades, cutter heads, cams, bits or belts according to work piece, machine functions and product specifications.			●											●	●	●	●		●		●	●			
E	Installing and adjusting blades, cutter heads, boring-bits and sanding-belts, and using hand tools and rules.			●											●	●	●	●		●		●	●			
F	Selects, controls, mounts and replaces cutting tools on the woodworking machines.			●											●	●	●	●		●		●	●			
G	Setting and adjusting various kinds of woodworking machines for operation by others; reading and interpreting specifications or following verbal instructions.			●										●	●	●	●	●		●		●	●			
H				●				●	●	●	●	●		●	●	●	●	●		●	●	●	●			

*McKinsey center and Ellen MacArthur Foundation

Tasks changes

Current and forecasted tasks changes due to sector circular economy transition (in green for 2030) and digitalization (in blue for 2025) for the occupational profile: Woodworking-machine tool setter and operator - ISCO 7523

2025/30

Occupational profile

Description forecast of the occupational profile in 2030

Woodworking machine tool setters and operators set-up, operate and monitor ecoefficient, semi-automatic or fully automated, even autonomous woodworking machines, such as precision sawing, shaping, planing, boring, turning and woodcarving machines to fabricate, remanufacture or repair wooden parts for furniture, fixtures and other wooden products.

- Works in accordance with basic health and safety regulations, including environmental protection and efficient energy use.
- Uses digitization software tools to work in a customer-oriented manner.
- Considers cost, environmental impact and time-effectiveness when planning and organizing his/her work in his/her area of influence.
- Contributes to continuous improvement of work processes in the company.
- Coordinates work with the rest of the team, report to his/her team leader.
- Cooperates with other departments (administrative, commercial, ICT- and technical services).
- Assists in the implementation of quality assurance and sustainability activities.
- Assists in the reduction of the environmental impact of the manufacturing, repair, remanufacturing or recycling processes (e.g. waste generation or energy use reduction, etc.).

	Virtualise	Virtualise direct aspects of the product	Virtualise indirect aspects of the product	**Exchange**	Replace old materials with advanced renewable ones	Apply new technologies	Choose new products and services	**Profile tasks forecast**
A			●		●	●		Using digital quality management to verify dimensions of articles to be made, or preparing specifications and checking the quality and fit of pieces in order to ensure adherence to technical & environmental specifications, including product durability.
B			●			●		Setting up, programming, operating and monitoring several types of connected and ecoefficient woodworking machines for sawing, shaping, boring, drilling, planing, pressing, turning, sanding or carving to fabricate or repair wooden parts for furniture, fixtures and other wooden products, trying to minimise the generated waste and the use of resources.
C			●		●	●		Operating special-purpose ecoefficient, automated and real-time optimized woodworking machines to fabricate wooden products such as coat hangers, mop handles, clothespins and other products, optimising the use of resources and the generation of waste.
D			●		●	●		Setting up flexible connected machines/cobots for selecting knives, saws, blades, cutter heads, cams, bits or belts according to work piece, machine functions and product specifications, optimising the use of resources, consumables and the generation of waste.
E			●		●	●		Installing and adjusting blades, cutter heads, boring-bits and sanding-belts using cobots and semi-autonomous robots, reducing the use of resources, consumables and the generation of waste.
F			●		●	●		Use cobots for the autonomous selection, control, mounting and replacing of cutting tools on the woodworking machines, reducing the use of resources, consumables and the generation of waste.
G			●		●	●		Setting and adjusting through digitized and remote controls various kinds of connected and ecoefficient woodworking machines for operation by others; studying and interpreting technical & environmental specifications using simulation models and mixed/augmented reality.
H					●	●		Operating tools and semi-automatic or fully automated, even autonomous woodworking machines for the maintenance, reparation and/or re-manufacturing of wood-based products, including cutting, polishing and/or additional finishing treatments.

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Woodworking-machine tool setter and operator ISCO 7523

2020

Occupational profile

Current profile description

Woodworking machine tool setters and operators set-up, operate and monitor automatic or semi-automatic woodworking machines such as precision sawing, shaping, planing, boring, turning and woodcarving machines to fabricate or repair wooden parts for furniture, fixtures and other wooden products.

- Works in accordance with basic health and safety regulations, including environmental protection and efficient energy use.
- Works in a customer-oriented manner.
- Considers cost- and time-effectiveness when planning and organizing his/her work in his/her area of influence.
- Contributes to continuous improvement of work processes in the company.
- Coordinates work with the rest of the team, report to his/her team leader.
- Cooperates with other departments (administrative, commercial and technical services).
- Assists in the implementation of quality assurance activities.

New categorization of hazards

Current profiles tasks		**Mechanical hazards**	Unprotected moving parts[1]	Parts with hazardous shapes (cutting, pointed, rough)	Moving means of transport and tools[2]	Uncontrolled moving parts (flying objects, wood chips)	Slip and trips	Falls from height	**Ergonomic hazards**	Heavy loads/heavy dynamic work	Awkward position/unbalanced strain	Repetitive movements	Lack of exercise, inactivity	**Electrical hazards**	Electric shock	**Hazards due to physical effects/physical agents**	Noise	Vibration	Laserlight	**Fire and explosion hazards**	Flammable substances	**Work environment hazards**	Poor lighting conditions	Climate	Poor ventilation	**Hazards through dangerous substances**	Dust	Solvents (neurotoxic, allergens)	Carcinogens	New materials (e.g. Nanomaterials)	Recycled material	**Biological Hazards**	Non-targeted activities with microorganism	**Psychosocial hazards**	Excessive workloads	Low job satisfaction	Work tasks not clearly defined
A	Verifying dimensions of articles to be made, or preparing specifications and checking the quality and fit of pieces in order to ensure adherence to specifications.																																					
B	Setting up, programming, operating and monitoring several types of woodworking machines for sawing, shaping, boring, drilling, planing, pressing, turning, sanding or carving to fabricate or repair wooden parts for furniture, fixtures and other wooden products.																																					
C	Operating preset special-purpose wood-working machines to fabricate wooden products such as coat hangers, mop handles, clothespins and other products.																																					
D	Selecting knives, saws, blades, cutter heads, cams, bits or belts according to work piece, machine functions and product specifications.																																					
E	Installing and adjusting blades, cutter heads, boring-bits and sanding-belts, and using hand tools and rules.																																					
F	Selects, controls, mounts and replaces cutting tools on the woodworking machines.																																					
G	Setting and adjusting various kinds of woodworking machines for operation by others; reading and interpreting specifications or following verbal instructions.																																					
H																																						

No changes · Reduced due to Circular Economy · New or increased due to Circular Economy · Reduced due to digitalization · New or increased due to digitalization

Hazards and risks changes

Current and forecasted tasks changes due to sector circular economy transition (in green for 2030) and digitalization (in blue for 2025) for the occupational profile: Woodworking-machine tool setter and operator - ISCO 7523

2025/30

Occupational profile

Description forecast of the occupational profile in 2030

Woodworking machine tool setters and operators set-up, operate and monitor ecoefficient, semi-automatic or fully automated, even autonomous woodworking machines, such as precision sawing, shaping, planing, boring, turning and woodcarving machines to fabricate, remanufacture or repair wooden parts for furniture, fixtures and other wooden products.

- Works in accordance with basic health and safety regulations, including environmental protection and efficient energy use.
- Uses digitization software tools to work in a customer-oriented manner.
- Considers cost, environmental impact and time-effectiveness when planning and organizing his/her work in his/her area of influence.
- Contributes to continuous improvement of work processes in the company.
- Coordinates work with the rest of the team, report to his/her team leader.
- Cooperates with other departments (administrative, commercial, ICT- and technical services).
- Assists in the implementation of quality assurance and sustainability activities.
- Assists in the reduction of the environmental impact of the manufacturing, repair, remanufacturing or recycling processes (e.g. waste generation or energy use reduction, etc.).

	Poor organisation of work	Poorly designed workplace environment (incl. software)	Repetitive, monotonous work	Cognitive strain	Stress due to long period concentration and awareness	Increased demands on flexibility	Lack of work experience	Lack of involvement in making decisions that affect the worker	Ineffective communication, lack of support from management or colleagues	Working alone/isolation	Workload: overload/underload	**Profile tasks forecast**
A	●	●		●	●	●	●		●	●	●	Using digital quality management to verify dimensions of articles to be made, or preparing specifications and checking the quality and fit of pieces in order to ensure adherence to technical & environmental specifications, including product durability.
B	●	●		●	●	●	●		●		●	Setting up, programming, operating and monitoring several types of connected and ecoefficient woodworking machines for sawing, shaping, boring, drilling, planing, pressing, turning, sanding or carving to fabricate or repair wooden parts for furniture, fixtures and other wooden products, trying to minimise the generated waste and the use of resources.
C	●	●		●	●	●	●		●		●	Operating special-purpose ecoefficient, automated and real-time optimized woodworking machines to fabricate wooden products such as coat hangers, mop handles, clothespins and other products, optimising the use of resources and the generation of waste.
D	●	●		●	●	●	●		●		●	Setting up flexible connected machines/cobots for selecting knives, saws, blades, cutter heads, cams, bits or belts according to work piece, machine functions and product specifications, optimising the use of resources, consumables and the generation of waste.
E	●	●		●	●	●	●		●		●	Installing and adjusting blades, cutter heads, boring-bits and sanding-belts using cobots and semi-autonomous robots, reducing the use of resources, consumables and the generation of waste.
F	●	●		●	●	●	●		●		●	Use cobots for the autonomous selection, control, mounting and replacing of cutting tools on the woodworking machines, reducing the use of resources, consumables and the generation of waste.
G	●	●		●	●	●	●		●		●	Setting and adjusting through digitized and remote controls various kinds of connected and ecoefficient woodworking machines for operation by others; studying and interpreting technical & environmental specifications using simulation models and mixed/augmented reality.
H	●	●		●	●	●	●		●		●	Operating tools and semi-automatic or fully automated, even autonomous woodworking machines for the maintenance, reparation and/or re-manufacturing of wood-based products, including cutting, polishing and/or additional finishing treatments.

1 Cobotics (Squeezing, bumping, crushing, cutting, amputation, drawing-in/trapping).
2 Run over, roll over, falls from height.

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Hazards and risks changes

Current and forecasted risks changes due to sector circular economy transition (in green for 2030) and digitalization (in blue for 2025) for the occupational profile: Woodworking-machine tool setter and operator - ISCO 7523

2020 Current situation	2025-30 Situation forecast
Work area: workshops with wood processing machines, hand and power tools such as (sanders, circular/cross-cut/ripsaws), wood storage, finishing of wood products.	Work area: workshops with wood processing machines, hand and power tools such as (sanders, circular/crosscut/ripsaws), wood storage, finishing of wood products, use of digitalized tools, work, programming of semi- or fully automated, even autonomous machines, use of digitalized software tools. Working with new and recycled material, remanufacture and repair of products. Reparation and remanufacture of wood-based products.
Mechanical hazards	
• Mechanical hazards from moving machines and tools. Woodworking machinery exposes workers to risks of being injured by unprotected moving parts, contact with moving blades (saw blade, drill, kick back etc), uncontrolled moving parts (flying objects, wood chips) and parts with hazardous shapes (cutting, pointed, rough).	• Mechanical hazards from moving machines and tools. Woodworking machinery exposes workers to risks of being injured by unprotected moving parts, contact with moving blades (saw blade, drill, kick back etc), uncontrolled moving parts (flying objects, wood chips) and parts with hazardous shapes (cutting, pointed, rough), and from cobots and robots. Some risks from mechanical hazards may decrease, depending on takeover of specific tasks by cobots/robots. Most of industrial cobots and robots are unaware of their surroundings therefore they can be dangerous to workers. Industrial robots can pose several types of hazards based on their origin: Mechanical hazards such as those arising from unintended and unexpected movements or release of tools. Better design of machinery and tools (ecodesign) could reduce hazards associated to working with woodworking machinery and hand power tools.
Effects: severe bruises, amputations, cuts and sharp injuries, crushing.	**Effects**: severe bruises, amputations, cuts and sharp injuries, crushing.
• Slips and trips, obstacles, table edges, moving vehicles, machines.	• Slips and trips, obstacles, table edges, moving vehicles, machines.
Effects: squeezing, cutting, twisting, spraining, bumps and bruises.	**Effects**: squeezing, cutting, twisting, spraining, bumps and bruises.
Ergonomic hazards	
• Ergonomic hazards: from poor ergonomic conditions, awkward positions, heavy physical workload.	• Ergonomic hazards: from poor ergonomic conditions, awkward positions, heavy physical workload. Risks from ergonomic hazards may decrease, depending on take over of specific tasks by cobots/robots. On the other hand, workers are increasingly exposed to ergonomic hazards such as lack of exercise/inactivity because of operating autonomous machines and cobots from computer workstations. The risk could be reduced with ecodesign strategies if occupational safety and health is taken into account when designing the product and machines.
Effect: musculoskeletal diseases.	**Effect**: musculoskeletal diseases.
Electrical hazards	
• Electrical hazards: contacts with live parts or connections or exposure to arc flash.	• Electrical hazards: contacts with live parts or connections or exposure to arc flash. Electrical hazards from woodworking machines and from autonomous or highly autonomous equipment.
Effect: fatal accident.	**Effect**: fatal accident.
Hazards due to physical effects/physical agents	
• Noise	• Noise: exposure to noise may decrease, depending on takeover of specific tasks by cobots/robots. The risk could be reduced with ecodesign strategies if occupational safety and health is taken into account when designing the product and machines.
Effects: hearing loss, headache, nervousness, poor concentration.	**Effects**: hearing loss, headache, nervousness, poor concentration.
• Vibrations	• Vibrations: exposure to vibrations may decrease, depending on takeover of specific tasks by cobots/robots. The risk could be reduced with ecodesign strategies if occupational safety and health is taken into account when designing the product and machines.
Effect: hand-arm-vibration syndrome (e.g. white finger disease).	**Effect**: hand-arm-vibration syndrome (e.g. white finger disease).
• Laserlight	• Laserlight: woodworking machine tool setters and operators may be exposed to laserlight.
Effects: eye damage, negative effects similar to sunburn.	**Effects**: eye damage, negative effects similar to sunburn.
Fire and explosion hazards	
• Fire and explosion hazardsfrom materials, including wood dust, solvents and chemicals.	• Fire and explosion hazards from materials, including wood dust, solvents and chemicals. Exposure to fire and explosion hazards may decrease, depending on takeover of specific tasks by cobots/robots. Solvents and cleaning products used for maintenance tasks may be based on less hazardous substances (e.g. solvents) and prevent fire hazards.

2020 Current situation	2025-30 Situation forecast
Work environmental hazards	
• Work environmental hazards: poor lighting, inadequate temperature and climate, poor ventilation.	• Work environmental hazards: poor lighting, inadequate temperature and climate, poor ventilation.
Effects: negative effects on muscles, tendons and joints, cold, poor concentration, eye strain.	**Effects**: negative effects on muscles, tendons and joints, cold, poor concentration, eye strain.
Hazards through dangerous substances	
• Chemical hazards/dangerous substances: wood dust.	• Chemical hazards/dangerous substances: wood dust, dust of recycled material. The risk of being exposed to wood dust may decrease, depending on takeover of specific tasks by cobots/robots. Maybe reduced, if OSH will be included in the design of the products/ materials, less dangerous solvents and lubricants.
Effects: contamination/intoxication, respiratory diseases, wood dusts (carcinogens, allergens) may cause nasal or lung cancer.	**Effects**: contamination/intoxication, respiratory diseases, wood dusts (carcinogens, allergens) may cause nasal or lung cancer.
	• New materials (e.g. nanomaterials): Nanotechnology and nanomaterials may be used in woods as well as wood-composite materials in order to improve some of their properties, e.g. to improve the water resistance or thermal conductivity. **Effects**: not yet well known, included are among others inflammation and tissue damage, fibrosis and tumour generation.
	• Recycled material: Risk of exposure to dangerous substances may be increased through lack of information on chemicals contained in recycled products and on ways how to deal with them appropriately. Recycled material may contain dangerous substances, to the latest findings carcinogen or repro-toxic. (nowadays restricted by law (REACH)). **Effects**: contamination/intoxication, skin diseases, respiratory diseases, cancer.
Psychosocial hazards	
• Organisation of work: time pressure, lack of experience, training and information, increased demand on flexibility, repetitive, monotonous work.	• Organisation of work: time pressure, lack of experience, training and information, increased demand on flexibility and digital know how, repetitive, monotonous work. Lack of experience: New software and digital devices require training, some workers may not have enough competences and may feel overloaded, not experienced enough. Increased demand on competences and up-to-date knowledge on the current development in circular economy and recycling industry. Working with materials which have previously been manufactured: new skills need to be acquired throughout the production cycle.
• Social relationship: lack of involvement in making decisions that affect the worker, difficult colleagues.	• Social relationship: lack of involvement in making decisions that affect the worker, difficult colleagues, lack of social contacts.
• Working method: working with colleagues.	• Working method: working with colleagues, digital equipment, cognitive interactions with autonomous equipment. The use of cobots and other digital techniques may increase the risk of working alone and feeling isolated. Cognitive interactions between a robot and a human worker can lead to mental stress. Long period of concentration working with computer and new software and performing multitasking. Increased demand on flexibility as workers may perform some tasks from everywhere with mobile devices. Workers are also at risk of being permanent available outside working hours.
Effects: stress, burnout.	**Effects**: stress, burnout.

Skills and competences needs

Forecast of training new needs due to sector circular economy transition (in green for 2030) and digitalization (in blue for 2025) for the occupational profile: Woodworking-machine tool setter and operator - ISCO 7523

Skills, knowledge and competences	Will it continue to be needed?	Main causes/reasons of change: Customisation/made to order	Reproductible and adaptable manufacturing	Minimize waste in production and supply chain	Increase efficiency of production processes	Remanufacture products and/or components	Promote the cascade use of wood	Apply new technologies	Use digitization tools to work in a customer-oriented manner	Setting up flexible connected machines/cobots	Using highly digitized, connected and automated (autonomous) woodworking machines	Human-robot collaboration, use of cobots, that can be remotely operated (with help of AR) using big data, simulation models and mixed/augmented reality	Using digital quality management
Essential skills and competences													
Consult technical resources	YES, changed	●		●		●	●						
Dispose of cutting waste material	YES, changed		●	●		●	●	●					
Maintain furniture machinery	YES												
Monitor automated machines	YES, changed	●	●	●	●	●	●	●	●			●	●
Operate furniture machinery	YES, changed		●	●		●		●		●	●	●	
Remove inadequate workpieces	YES, changed												●
Remove processed workpiece	YES												
Set up the controller of a machine	YES, changed									●			
Supply machine	YES												
Supply machine with appropriate tools	YES, changed									●	●	●	
Disassemble wood-based furniture products	NEW	●	●	●		●	●			●		●	
Examine disassembled pieces for further steps (reuse, recylce, upcycle)	NEW	●	●	●	●	●	●	●		●		●	●
Repair wood-based furniture pieces, where needed	NEW	●	●	●	●	●	●	●		●		●	●
Essential knowledge													
Machine tools	YES												
Quality standards	YES, changed	●	●	●	●	●	●	●					●
Types of wood	NO												
Generic green skills, knowledge and competences (*)													
Environmental awareness and willingness to learn	NEW	●	●	●	●	●	●	●					
Systems and risk analysis skills	NA												
Innovation skills	NA												
Coordination, management and business skills	NA												
Communication and negotiation skills	NA												
Marketing skills	NA												
Strategic and leadership skills	NA												
Consulting skills	NA												
Networking, information technology and language skills	NA												
Adaptability and transferability skills	NEW	●	●	●	●	●	●	●					
Entrepreneurial skills	NA												
Waste, energy and water quantification and monitoring	NEW	●	●	●	●			●					
Material use and impact quantification and monitoring	NEW	●	●		●	●	●	●					
Material use and impact minimisation	NEW	●	●		●	●	●	●					

(*) Source: Strietskallina et al. and Dr. Margarita Pavlova

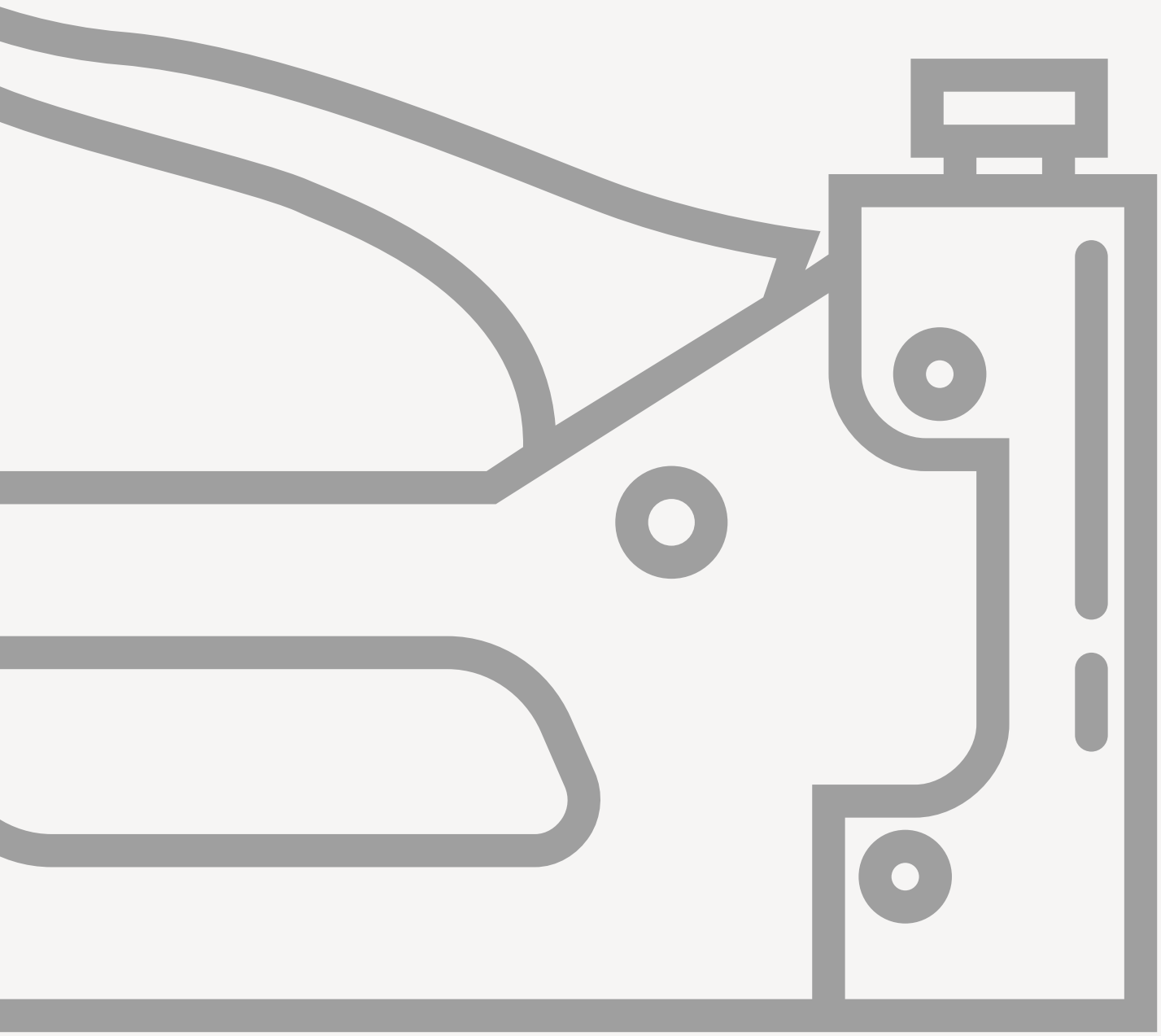
Upholsterer and related workers
ISCO 7534

You will find three different types of tables for each occupational profile, where the forecasted changes due to sector circular economy transition are in green colour and due to sector digitalization are in blue colour.

Tasks changes
Current and forecasted tasks changes.

Hazards and risks changes
Current and forecasted risks changes.

Skills and competences need
Forecast of training new needs.



Upholsterer and related workers
ISCO 7534

Unfold this to see the current occupational profile description and its tasks and to relate them to the following green table and first yellow table.

Tasks changes

Hazards and risks changes

Hazards and risks comments

Skills and competences needs

КЪМ ИНДЕКС

Upholsterer and related workers ISCO 7534

2020
Occupational profile

Current profile description
Upholsterers and related workers install, repair and replace upholstery of furniture, fixtures, seats, panels, convertible and vinyl tops and other furnishings of automobiles, railway coaches, aircraft, ships and similar items with fabric, leather, rexine or other upholstery material. They also make and repair cushions, quilts and mattresses.

- Works in accordance with basic health and safety regulations, including environmental protection and efficient energy use.
- Works in a customer-oriented manner.
- Considers cost- and time-effectiveness when planning and organizing his/her work in his/her area of influence.
- Contributes to continuous improvement of work processes in the company.
- Coordinates work with the rest of the team, report to his/her team leader.
- Cooperates with other departments (administrative, commercial and technical services).
- Assists in the implementation of quality assurance activities.

Current profiles tasks		ReSOLVE levers*																							
		Regenerate	Shift to renewable energies	Shift to renewable materials	Reclaim, retain, and regenerate health of ecosystems	Return recovered biological resources to the biosphere	**Share**	Reduce product replacement speed and increase product utilisation by sharing it among different users	Reuse products throughout their technical lifetime	Prolong products lifetime through maintenance	Prolong products lifetime through repair	Prolong products lifetime through design for durability	**Optimise**	Increase performance/efficiency of products	Customisation/made to order	Reproductible and adaptable manufacturing	Minimize waste in production and supply chain	Increase efficiency of production processes	**Loop**	Remanufacture products and/or components	Implement take-back programs	Recycle materials	Promote the cascade use of wood	Promote extraction of biochemicals from organic waste	
A	Discussing upholstery fabric, colour and style with customers and providing cost estimates for upholstering furniture or other items.			●					●	●	●	●		●	●	●	●	●		●	●	●	●		
B	Verifying dimensions of articles to be made, or preparing specifications and checking the quality and fit of pieces in order to ensure adherence to specifications.			●					●		●	●		●	●	●	●	●		●	●	●	●		
C	Making upholstery patterns from sketches, customer descriptions or blueprints.			●				●	●	●	●	●		●	●	●	●	●				●	●		
D	Laying out, measuring and cutting upholstery materials following patterns, templates, sketches or design specifications.			●					●		●				●	●	●	●				●			
E	Installing, arranging and securing springs, padding and covering material to furniture frames.			●					●	●	●	●			●	●	●	●		●	●	●	●		
F	Sewing upholstery materials by hand to seam cushions and joining sections of covering materials.			●					●	●	●	●			●	●	●	●		●	●	●	●		
G	Sewing rips or tears in material, or creating tufting, using needle and thread or hand operated machines for sewing-/locking.								●	●	●	●			●	●	●	●		●	●				
H	Tacking, gluing or sewing ornamental trims, buckles, braids, buttons and other accessories to covers or frames on upholstered items.			●					●	●	●	●		●	●	●	●	●		●	●	●	●		
I	Laying out, cutting, fabricating and installing upholstery. • Installing upholstery on the structure. • Finishing of the upholstery.			●					●	●	●	●		●	●	●	●	●		●	●	●	●		
J	Renovating antique furniture using a variety of tools including ripping chisels, magnetic hammers and long needles • Ripping off the seats and sofas. • Demounting of the (structural) parts. • Renovating of the upholstery.			●				●	●	●	●	●		●	●	●	●	●		●	●	●	●		
K	Collaborating with interior designers to decorate rooms and coordinate furnishing fabrics.			●				●	●	●	●	●			●	●	●	●			●	●	●		
L	Making quilts, cushions and mattresses. • Filling up cushions. • Filling up mattresses.			●					●	●	●	●		●	●	●	●	●			●	●	●		
M				●				●						●		●	●				●	●	●	●	
N				●				●	●	●	●	●		●	●	●	●	●		●	●	●	●		

*McKinsey center and Ellen MacArthur Foundation

Tasks changes

Current and forecasted tasks changes due to sector circular economy transition (in green for 2030) and digitalization (in blue for 2025) for the occupational profile: Upholsterer and related workers - ISCO 7534

2025/30

Occupational profile

Description forecast of the occupational profile in 2030

Upholsterers and related workers install, repair, remanufacture and replace upholstery of furniture, fixtures, seats, panels, convertible and vinyl tops and other furnishings of automobiles, railway coaches, aircraft, ships and similar items with fabric, leather, rexine or other upholstery material using ecoefficient semi-automatic or fully automated machines. They also make and repair cushions, quilts and mattresses.

- Works in accordance with basic health and safety regulations, including environmental protection and efficient energy use.
- Uses digitization tools to work in a customer-oriented manner.
- Considers cost, environmental impact and time-effectiveness when planning and organizing his/her work in his/her area of influence.
- Contributes to continuous improvement of work processes in the company.
- Coordinates work with the rest of the team, report to his/her team leader.
- Cooperates with other departments (administrative, commercial, ICT- and technical services).
- Assists in the implementation of quality assurance and sustainability activities.
- Assists in the reduction of the environmental impact of the manufacturing, repair, remanufacturing or recycling processes (e.g. materials used, waste generation or energy use reduction, etc.).
- Uses a life-cycle thinking approach when takes decissions on the materials to be used and favours the future disassembly of the product for maintenance, repair, reuse or recycling.

Virtualise	Virtualise direct aspects of the product	Virtualise indirect aspects of the product	**Exchange**	Replace old materials with advanced renewable ones	Apply new technologies	Choose new products and services		**Profile tasks forecast**
	●	●		●	●	●	A	Using digital simulation models, discussing preferable eco-friendly upholstery fabric, colour and style with customers and providing cost estimates for upholstering furniture or other items, proposing sustainable materials and considering the future circularity of the product.
	●	●		●	●	●	B	Using computer vision and digital twin simulation models, verifying dimensions of articles to be made, or preparing specifications and checking the quality and fit of pieces in order to ensure adherence to technical & environmental specifications, including product durability, reparability, etc.
	●	●		●	●		C	Making upholstery patterns from digital models, sketches, customer descriptions, trying to favour sustainable raw materials and reducing as much as possible the generation of waste and the quantity of used materials.
		●			●		D	Laying out, measuring and cutting eco-friendly upholstery materials using advanced digital process control following patterns, templates, sketches or design specifications, reducing as much as possible the scrap generated in the process.
				●	●		E	Highly automated installing, arranging and securing springs, padding and eco-friendly covering material to furniture frames, thinking on the future needs for maintenance, repair, reuse or substitution of the product.
					●		F	Sewing eco-friendly upholstery materials to seam cushions and joining sections of covering materials using semi-automated processes and connected cobots thinking on the future needs or disassembly for maintenance, repair or recycling of the product.
		●			●		G	Using computer vision and big data analytics to automate the process of sewing rips or tears in material, or creating tufting, using fully automated cobots with needle and thread or semi-autonomous and ecoefficient machines for sewing-/locking; and considering the future need for maintenance, repair or recycling of the product.
				●	●		H	Semi-autonomously tacking, gluing or sewing ornamental trims, buckles, braids, buttons and other accessories to covers or frames on upholstered items using cobots and considering aspects such as materials' compatibility for recycling, future disassembly needs, etc. (e.g. reducing glued components).
	●	●		●	●	●	I	Highly automated laying out, cutting, fabricating and installing upholstery using ecoefficient and autonomous robots connected to the big data cloud. • Selecting sustainable materials and circular economy-oriented strategies (e.g. repairability). • Installing upholstery on the structure. • Finishing of the upholstery.
		●		●	●	●	J	Renovating antique furniture with highly automated machines and cobots using a variety of tools including ripping chisels, magnetic hammers and long needles. • Ripping off the seats and sofas. • Demounting of the (structural) parts. • Checking what parts can be reused, repaired or need to be replaced. • Renovating of the upholstery. • Facilitating future maintenance, repair, reuse or recycling.
	●	●		●	●	●	K	Using digital models and augmented reality to collaborate with interior designers to decorate rooms and coordinate furnishing fabrics, selecting sustainable materials and applying circular economy-oriented strategies.
	●	●		●	●	●	L	Fully automated and ecoefficient manufacturing of eco-friendly quilts, cushions and mattresses, optimising the use of resources and reducing the generation of waste. • Filling up cushions. • Filling up mattresses.
				●			M	Operating the adequate tools for selective and/or destructive disassembling of out of use or defective upholstery articles for separation of materials and elements for further recovery or recycling.
		●		●	●	●	N	Operating highly automated machines and cobots for the maintenance, reparation and/or re-manufacturing of upholstery or upholstered parts of furniture, including cleaning, cutting, etc.

Upholsterer and related workers ISCO 7534

2020
Occupational profile

Current profile description
Upholsterers and related workers install, repair and replace upholstery of furniture, fixtures, seats, panels, convertible and vinyl tops and other furnishings of automobiles, railway coaches, aircraft, ships and similar items with fabric, leather, rexine or other upholstery material. They also make and repair cushions, quilts and mattresses.

- Works in accordance with basic health and safety regulations, including environmental protection and efficient energy use.
- Works in a customer-oriented manner.
- Considers cost- and time-effectiveness when planning and organizing his/her work in his/her area of influence.
- Contributes to continuous improvement of work processes in the company.
- Coordinates work with the rest of the team, report to his/her team leader.
- Cooperates with other departments (administrative, commercial and technical services).
- Assists in the implementation of quality assurance activities.

New categorization of hazards

Current profiles tasks		**Mechanical hazards**	Unprotected moving parts[1]	Parts with hazardous shapes (cutting, pointed, rough)	Moving means of transport and tools[2]	Uncontrolled moving parts (flying objects, wood chips)	Slip and trips	Falls from height	**Ergonomic hazards**	Heavy loads/heavy dynamic work	Awkward position/unbalanced strain	Repetitive movements	Lack of exercise, inactivity	**Electrical hazards**	Electric shock	**Hazards due to physical effects/physical agents**	Noise	Vibration	Laserlight	**Fire and explosion hazards**	Flammable substances	**Work environment hazards**	Poor lighting conditions	Climate	Poor ventilation	**Hazards through dangerous substances**	Dust	Solvents (neurotoxic, allergens)	Carcinogens	New materials (e.g. Nanomaterials)	Recycled material	**Biological Hazards**	Non-targeted activities with microorganism	**Psychosocial hazards**	Excessive workloads	Low job satisfaction	Work tasks not clearly defined
A	Discussing upholstery fabric, colour and style with customers and providing cost estimates for upholstering furniture or other items.												●										●	●										●		●
B	Verifying dimensions of articles to be made, or preparing specifications and checking the quality and fit of pieces in order to ensure adherence to specifications.												●										●	●										●		●
C	Making upholstery patterns from sketches, customer descriptions or blueprints.												●										●	●										●		●
D	Laying out, measuring and cutting upholstery materials following patterns, templates, sketches or design specifications.		●	●			●				● ●	●	●		●	● ●	● ●	●					●	●	●					●	●				●		●
E	Installing, arranging and securing springs, padding and covering material to furniture frames.		●	●		●	●				● ●	●	●		●	● ●	● ●						●	●	●		●			●	●				●		●
F	Sewing upholstery materials by hand to seam cushions and joining sections of covering materials.		●	●			●				● ●	●	●		●	● ●	● ●						●	●	●					●	●				●		●
G	Sewing rips or tears in material, or creating tufting, using needle and thread or hand operated machines for sewing-/locking.		●	●			●				● ●	●	●		●	● ●	● ●						●	●	●					●	●				●		●
H	Tacking, gluing or sewing ornamental trims, buckles, braids, buttons and other accessories to covers or frames on upholstered items.		●	●			●				● ●	●	●		●	● ●				● ●			●	●	●			●	●	●	●				●		●
I	Laying out, cutting, fabricating and installing upholstery. • Installing upholstery on the structure. • Finishing of the upholstery.		●	●			●				● ●	●	●		●	● ●	● ●						●	●	●		●	●	●	●	●				●		●
J	Renovating antique furniture using a variety of tools including ripping chisels, magnetic hammers and long needles • Ripping off the seats and sofas. • Demounting of the (structural) parts. • Renovating of the upholstery.		●	●			●				● ●	●	●		●	● ●	● ●						●	●	●		●	●	●	●	●		●		●		●
K	Collaborating with interior designers to decorate rooms and coordinate furnishing fabrics.												●										●	●										●		●
L	Making quilts, cushions and mattresses. • Filling up cushions. • Filling up mattresses.										● ●	●				● ●	● ●						●	●				●							●	●	●	●
M			●	●		●	●				●				●	●	●			●			●	●	●		●				●		●		●		●
N			●	●		●	●				●				●	●	●			●			●	●	●		●				●		●		●		●

● No changes ● Reduced due to Circular Economy ● New or increased due to Circular Economy ● Reduced due to digitalization ● New or increased due to digitalization

Hazards and risks changes

Current and forecasted tasks changes due to sector circular economy transition (in green for 2030) and digitalization (in blue for 2025) for the occupational profile: Upholsterer and related workers - ISCO 7534

2025/30

Occupational profile

Description forecast of the occupational profile in 2030

Upholsterers and related workers install, repair, remanufacture and replace upholstery of furniture, fixtures, seats, panels, convertible and vinyl tops and other furnishings of automobiles, railway coaches, aircraft, ships and similar items with fabric, leather, rexine or other upholstery material using ecoefficient semi-automatic or fully automated machines. They also make and repair cushions, quilts and mattresses.

- Works in accordance with basic health and safety regulations, including environmental protection and efficient energy use.
- Uses digitization tools to work in a customer-oriented manner.
- Considers cost, environmental impact and time-effectiveness when planning and organizing his/her work in his/her area of influence.
- Contributes to continuous improvement of work processes in the company.
- Coordinates work with the rest of the team, report to his/her team leader.
- Cooperates with other departments (administrative, commercial, ICT- and technical services).
- Assists in the implementation of quality assurance and sustainability activities.
- Assists in the reduction of the environmental impact of the manufacturing, repair, remanufacturing or recycling processes (e.g. materials used, waste generation or energy use reduction, etc.).
- Uses a life-cycle thinking approach when takes decissions on the materials to be used and favours the future disassembly of the product for maintenance, repair, reuse or recycling.

	Poor organisation of work	Poorly designed workplace environment (incl. software)	Repetitive, monotonous work	Cognitive strain	Stress due to long period concentration and awareness	Increased demands on flexibility	Lack of work experience	Lack of involvement in making decisions that affect the worker	Ineffective communication, lack of support from management or colleagues	Working alone/isolation	Workload: overload/underload	Profile tasks forecast
A	●	●		●	●	●	●		●		●	Using digital simulation models, discussing preferable eco-friendly upholstery fabric, colour and style with customers and providing cost estimates for upholstering furniture or other items, proposing sustainable materials and considering the future circularity of the product.
B	●	●		●	●	●	●		●	●	●	Using computer vision and digital twin simulation models, verifying dimensions of articles to be made, or preparing specifications and checking the quality and fit of pieces in order to ensure adherence to technical & environmental specifications, including product durability, reparability, etc.
C	●	●		●	●	●	●		●	●	●	Making upholstery patterns from digital models, sketches, customer descriptions, trying to favour sustainable raw materials and reducing as much as possible the generation of waste and the quantity of used materials.
D	●	●		●	●	●	●		●	●	●	Laying out, measuring and cutting eco-friendly upholstery materials using advanced digital process control following patterns, templates, sketches or design specifications, reducing as much as possible the scrap generated in the process.
E	●	●		●	●	●	●		●	●	●	Highly automated installing, arranging and securing springs, padding and eco-friendly covering material to furniture frames, thinking on the future needs for maintenance, repair, reuse or substitution of the product.
F	●	●		●	●	●	●		●	●	●	Sewing eco-friendly upholstery materials to seam cushions and joining sections of covering materials using semi-automated processes and connected cobots thinking on the future needs or disassembly for maintenance, repair or recycling of the product.
G	●	●		●	●	●	●		●	●	●	Using computer vision and big data analytics to automate the process of sewing rips or tears in material, or creating tufting, using fully automated cobots with needle and thread or semi-autonomous and ecoefficient machines for sewing-/locking; and considering the future need for maintenance, repair or recycling of the product.
H	●	●		●	●	●	●		●	●	●	Semi-autonomously tacking, gluing or sewing ornamental trims, buckles, braids, buttons and other accessories to covers or frames on upholstered items using cobots and considering aspects such as materials' compatibility for recycling, future disassembly needs, etc. (e.g. reducing glued components).
I	●	●		●	●	●	●		●	●	●	Highly automated laying out, cutting, fabricating and installing upholstery using ecoefficient and autonomous robots connected to the big data cloud. • Selecting sustainable materials and circular economy-oriented strategies (e.g. repairability). • Installing upholstery on the structure. • Finishing of the upholstery.
J	●	●		●	●	●	●		●	●	●	Renovating antique furniture with highly automated machines and cobots using a variety of tools including ripping chisels, magnetic hammers and long needles. • Ripping off the seats and sofas. • Demounting of the (structural) parts. • Checking what parts can be reused, repaired or need to be replaced. • Renovating of the upholstery. • Facilitating future maintenance, repair, reuse or recycling.
K	●	●		●	●	●	●		●		●	Using digital models and augmented reality to collaborate with interior designers to decorate rooms and coordinate furnishing fabrics, selecting sustainable materials and applying circular economy-oriented strategies.
L	●	●		●	●	●	●		●	●	●	Fully automated and ecoefficient manufacturing of eco-friendly quilts, cushions and mattresses, optimising the use of resources and reducing the generation of waste. • Filling up cushions. • Filling up mattresses.
M	●					●	●				●	Operating the adequate tools for selective and/or destructive disassembling of out of use or defective upholstery articles for separation of materials and elements for further recovery or recycling.
N	●				●	●	●			●	●	Operating highly automated machines and cobots for the maintenance, reparation and/or re-manufacturing of upholstery or upholstered parts of furniture, including cleaning, cutting, etc.

1 Cobotics (Squeezing, bumping, crushing, cutting, amputation, drawing-in/trapping).
2 Run over, roll over, falls from height.

Hazards and risks changes

Current and forecasted risks changes due to sector circular economy transition (in green for 2030) and digitalization (in blue for 2025) for the occupational profile: Upholsterer and related workers – ISCO 7534

2020 Current situation	2025-30 Situation forecast
Work area: workshops with upholsterer machines (sewing machine), hand and power tools such as (steam iron, pneumatic staple gun, tack hammer, scissors, hammer, knife, pliers, screwdrivers, hand brushes. hot melt glue guns), on-site workplaces (cars, airplanes, ships and others), discussion with clients and textile salesmen.	Work area: workshops with upholsterer machines (sewing machine), hand and power tools such as (steam iron, pneumatic staple gun, tack hammer, scissors, hammer, knife, pliers, screwdrivers, hand brushes. hot melt glue guns), on-site workplaces (cars, airplanes, ships and others), discussion with clients and textile salesmen, use of digitalized instruments, use of eco-friendly materials, life-cycle thinking approach when taking decisions on the materials and design of the product (taking into account disassembly of the product for maintenance, repair, reuse or recycling).
Mechanical hazards	
• Mechanical hazards from moving machines and tools. Machinery used in upholstery exposes workers to risks of being injured by unprotected moving parts, uncontrolled moving parts (air tools/electric staplers, springs) and parts with hazardous shapes (cutting, pointed, rough).	• Mechanical hazards from moving machines and tools. Machinery used in upholstery exposes workers to risks of being injured by unprotected moving parts, uncontrolled moving parts (air tools/electric staplers, springs) and parts with hazardous shapes (cutting, pointed, rough), and from cobots and robots. Risks from mechanical hazards may decrease, depending on takeover of specific task by cobots/robots. Remanufacturing and selective disassembling could require new types of tools. Risks of being injured by unprotected moving parts, uncontrolled moving parts (air tools/electric staplers, springs) and parts with hazardous shapes (cutting, pointed, rough). Better design of products (ecodesign) could reduce hazards associated to assembly/disassembly operations, using optimised joining systems, etc.
Effects: severe bruises, cuts and sharp injuries.	**Effects**: severe bruises, cuts and sharp injuries.
Slips and trips, obstacles, table edges, moving vehicles, machines.	Slips and trips, obstacles, table edges, moving vehicles, machines.
Effects: squeezing, cutting, twisting, spraining, bumps and bruises.	**Effects**: squeezing, cutting, twisting, spraining, bumps and bruises.
Ergonomic hazards	
• Ergonomic hazards: from poor ergonomic conditions, awkward positions.	• Ergonomic hazards: from poor ergonomic conditions, awkward positions. Risks from ergonomic hazards may decrease, depending on take over of specific task by cobots/robots. On the other hand, workers are increasingly exposed to ergonomic hazards such as lack of exercise/ inactivity because of operating autonomous machines and cobots from computer workstations. Remanufacturing and selective disassembling may be performed in unsuitable positions. This risk could be reduced with ecodesign strategies to facilitate assembly/disassembly (e.g. type of fasteners, etc.) if occupational safety and health is taken into account when designing the product.
Effect: musculoskeletal diseases.	**Effect**: musculoskeletal diseases.
Electrical hazards	
Electric hazards: contacts with live parts or connections or exposure to arc flash.	Electric hazards: contacts with live parts or connections or exposure to arc flash. Electrical hazards from upholstery machines and from autonomous or highly autonomous equipment.
Effect: fatal accident.	**Effect**: fatal accident.
Hazards due to physical effects/physical agents	
• Noise	• Noise: exposure to noise may decrease, depending on takeover of specific task by cobots/robots. Noise maybe reduced due to ecodesign of machinery operating quieter and more environmental-friendly. However, dismantling or remanufacturing upholstered furniture may pose workers at risk of noise.
Effects: hearing loss, headache, nervousness, poor concentration.	**Effects**: hearing loss, headache, nervousness, poor concentration.
• Vibrations	• Vibrations: exposure to noise and vibration risks may decrease, depending on takeover of specific task by cobots/robots. Vibration maybe reduced due to ecodesign of machinery operating with less vibration energy and more environmental-friendly. However, dismantling or remanufacturing upholstered furniture may pose workers still at risk of vibration.
Effects: hand-arm-vibration syndrome (e.g. white finger disease).	**Effects**: hand-arm-vibration syndrome (e.g. white finger disease).
• Laserlight	• Laserlight: exposure to laserlight from laser cutting machines used to cut leather and other fabrics.
Effects: eye and skin injuries resulting from a direct laser beam or a reflection of the beam.	Effects: eye and skin injuries resulting from a direct laser beam or a reflection of the beam.
Fire and explosion hazards	
• Fire and explosion hazards from materials, including glue, solvents and other chemicals. High risk of fire and explosion due to the presence of flammable solvents/glues and other flammable material and the accumulation of solvent vapours, particularly in small, unventilated areas.	• Fire and explosion hazards from materials, including glue, solvents and other chemicals. High risk of fire and explosion due to the presence of flammable solvents/glues and other flammable material and the accumulation of solvent vapours, particularly in small, unventilated areas. Risks from explosion and fire may decrease, depending on takeover of specific task by cobots/robots. Risk from explosion and fire may decrease, depending on the substitution of flammable solvents in glues. In recycling, dismantling or disassembling activities the risk of dust explosion may increase, because of dust formation (emission) and not suitable dust extraction systems.
Effects: burns, fatal accidents.	**Effects**: burns, fatal accidents.

2020 Current situation	2025-30 Situation forecast
Work environmental hazards	
• Work environmental hazards: poor lighting, inadequate temperature and climate, poor ventilation.	• Work environmental hazards: poor lighting, inadequate temperature and climate, poor ventilation.
Effect: negative effects on muscles, tendons and joints, cold, poor concentration, eye strain.	**Effect**: negative effects on muscles, tendons and joints, cold, poor concentration, eye strain.
Hazards through dangerous substances	
• Chemical hazards/ dangerous substances: toxic flame retardants, wood dust, solvents, preservatives, formaldehyde, glues.	• Chemical hazards/ dangerous substances: toxic flame retardants, wood dust, solvents, preservatives, formaldehyde, glues, new substances/materials. Chemical hazards may decrease depending on the substitution of dangerous substances (no toxic flame retardants in the material). Chemical hazards may increase depending on the quality of recycled materials (during successive recycling of unknown raw materials).
• Upholsterers usually require an extensive use of solvents. Glues and solvents for assembling parts and finishing products. Injury of the eyes caused by splashing glue, cleaners, etc., burns caused by contact with hot glue/glue guns, allergies due to contact with formaldehyde and allergenic substances, exposure to dust.	• Upholsterers usually require an extensive use of solvents. Glues and solvents for assembling parts and finishing products. Injury of the eyes caused by splashing glue, cleaners, etc., burns caused by contact with hot glue/glue guns, allergies due to contact with formaldehyde and allergenic substances, exposure to dust. Exposure to chemicals may decrease, depending on takeover of specific task by cobots/robots. Exposure to chemicals may decrease depending on the integration of OSH into the design of new processes, techniques (prevention through design), substitution of dangerous substances (no toxic flame retardants in the material).
Effects: contamination/intoxication, skin diseases, respiratory diseases, allergies, cancer.	**Effects**: contamination/intoxication, skin diseases, respiratory diseases, allergies, cancer.
	• New materials (e.g. nanomaterials): Nanotechnology and nanomaterials may be used in woods as well as wood-composite materials in order to improve some of their properties, e.g. to improve the water resistance or thermal conductivity. **Effects**: not yet well known, included are among others inflammation and tissue damage, fibrosis and tumour generation.
	• Recycled material may concentrate hazardous substances (impurities and hazardous flame retardants mainly in upholstery products) during successive recycling or may change the composition due to different factors such as light, heat and aging of material unknown content and kind of hazardous substances. Exposure may increase when working with recycled material or performing disassembling/ dismantling activities. Workers may be exposed to dangerous substances used in former times, now restricted by law. Disassembling may also be related to an increased risk of inhaled dust. **Effects**: contamination/intoxication, skin diseases, respiratory diseases, allergies, cancer.
Biological hazards	
• Biological hazards: bacteria, mould and fungi.	• Non-targeted activities with microorganism: Remanufacturing activities: selective and/ or destructive disassembling of out of use or defective upholstery articles for separation of materials and elements for further recovery or recycling may expose workers to microorganism such as mould (Recycled, old and used material may contain mould).
Effects: contamination/intoxication, skin diseases, respiratory diseases, infections.	**Effects**: contamination/intoxication, skin diseases, respiratory diseases, infections.
Psychosocial hazards	
• Organisation of work: time pressure, lack of experience, training and information, increased demand on flexibility, repetitive work.	• Organisation of work: time pressure, shift work, stress, often related to poor work organisation lack of training, increased demand on flexibility and digital know how, repetitive and monotonous work.
	• Lack of experience: New software and digital devices require training, some workers may not have enough competences and may feel overloaded, not experienced enough. Working with materials which have previously been manufactured: new skills need to be acquired throughout the production cycle. Repair, remanufacture and selective disassembly require new methods and procedures. Deciding on circular economic and sustainable oriented strategies/products/ marketing projects.
• Social relationship: lack of involvement in making decisions that affect the worker, difficult colleagues.	• Social relationship: lack of involvement in making decisions that affect the worker, difficult colleagues, lack of social contacts.
• Working method: working with colleagues.	• Working method: working with colleagues, digital equipment, cognitive interactions with autonomous technologies. The use of cobots and other digital techniques may increase the risk of working alone and feeling isolated. Cognitive interactions between a robot and a human worker can lead to mental stress. Long period of concentration working with computer and new software and performing multitasking. Increased demand on flexibility as workers may perform some tasks from everywhere with mobile devices. Workers are also at risk of being permanent available outside working hours.
Effects: stress, burnout and emotional distress, suffering from depression, cardiovascular problems, sleep disorders.	**Effects**: stress, burnout and emotional distress, suffering from depression, cardiovascular problems, sleep disorders.

Skills and competences needs

Forecast of training new needs due to sector circular economy transition (in green for 2030) and digitalization (in blue for 2025) for the occupational profile: Upholsterer and related workers – ISCO 7534

Skills, knowledge and competences	Will it continue to be needed?	Main causes/reasons of change: Shift to renewable materials	Reuse products throughout their technical lifetime	Prolong products lifetime through repair	Customisation/made to order	Reproductible and adaptable manufacturing	Minimize waste in production and supply chain	Increase efficiency of production processes	Remanufacture products and/or components	Recycle materials	Promote the cascade use of wood	Apply new technologies	Using semi-automatic or fully automated operating machines and connected cobots	Use digitization tools to work in a customer-oriented manner	Using digital simulation models, computer vision and digital twin simulation models	Using advanced digital process control
Essential skills and competences																
Clean furniture	YES															
Create patterns for textile products	YES, changed	●			●	●	●		●	●				●	●	●
Cut textiles	YES, changed	●			●	●	●		●	●			●	●	●	●
Decorate furniture	YES															
Fasten components	YES, changed												●		●	
Install springsuspension	YES, changed												●			
Perform upholstery repair	YES, changed	●	●	●	●		●		●	●	●		●			
Provide customized upholstery	YES, changed	●			●				●	●			●	●	●	
Sew pieces of fabric	YES, changed	●			●	●	●		●	●			●		●	●
Sew textile-based articles	YES, changed	●			●	●	●		●	●			●	●	●	●
Use manual sewing techniques	YES, changed		●	●	●		●		●	●						
Disassemble wood-based furniture products	NEW		●	●		●	●		●	●	●		●			●
Examine disassembled pieces for further steps (reuse, recylce, upcycle)	NEW		●	●			●		●	●	●			●	●	
Repair wood-based furniture pieces, where needed	NEW		●	●			●		●	●	●		●			●
Essential knowledge																
Furniture industry	YES															
Furniture trends	YES, changed	●	●	●	●		●	●	●	●	●	●				
Textile materials	YES, changed	●					●		●	●			●		●	
Upholstery fillings	YES, changed	●					●		●	●	●		●		●	
Upholstery tools	YES, changed	●	●	●		●	●	●	●			●	●			
Generic green skills, knowledge and competences (*)																
Environmental awareness and willingness to learn	NEW	●	●	●				●	●	●	●					
Systems and risk analysis skills	NEW										●					
Innovation skills	NEW	●			●	●			●		●	●				
Coordination, management and business skills	NA															
Communication and negotiation skills	NEW	●	●	●	●		●			●	●					
Marketing skills	NA															
Strategic and leadership skills	NA															
Consulting skills	NEW	●	●	●	●		●			●	●					
Networking, information technology and language skills	NA															
Adaptability and transferability skills	NEW	●				●	●	●	●	●	●	●				
Entrepreneurial skills	NA															
Waste, energy and water quantification and monitoring	NEW		●	●		●	●	●	●		●	●				
Material use and impact quantification and monitoring	NEW	●	●	●		●	●	●	●		●	●				
Material use and impact minimisation	NEW	●	●	●	●		●		●	●	●	●				

(*) Source: Strietskallina et al. and Dr. Margarita Pavlova

Wood processing plant operator
ISCO 8172

You will find three different types of tables for each occupational profile, where the forecasted changes due to sector circular economy transition are in green colour and due to sector digitalization are in blue colour.

Tasks changes
Current and forecasted tasks changes.

Hazards and risks changes
Current and forecasted risks changes.

Skills and competences need
Forecast of training new needs.

Wood processing plant operator
ISCO 8172

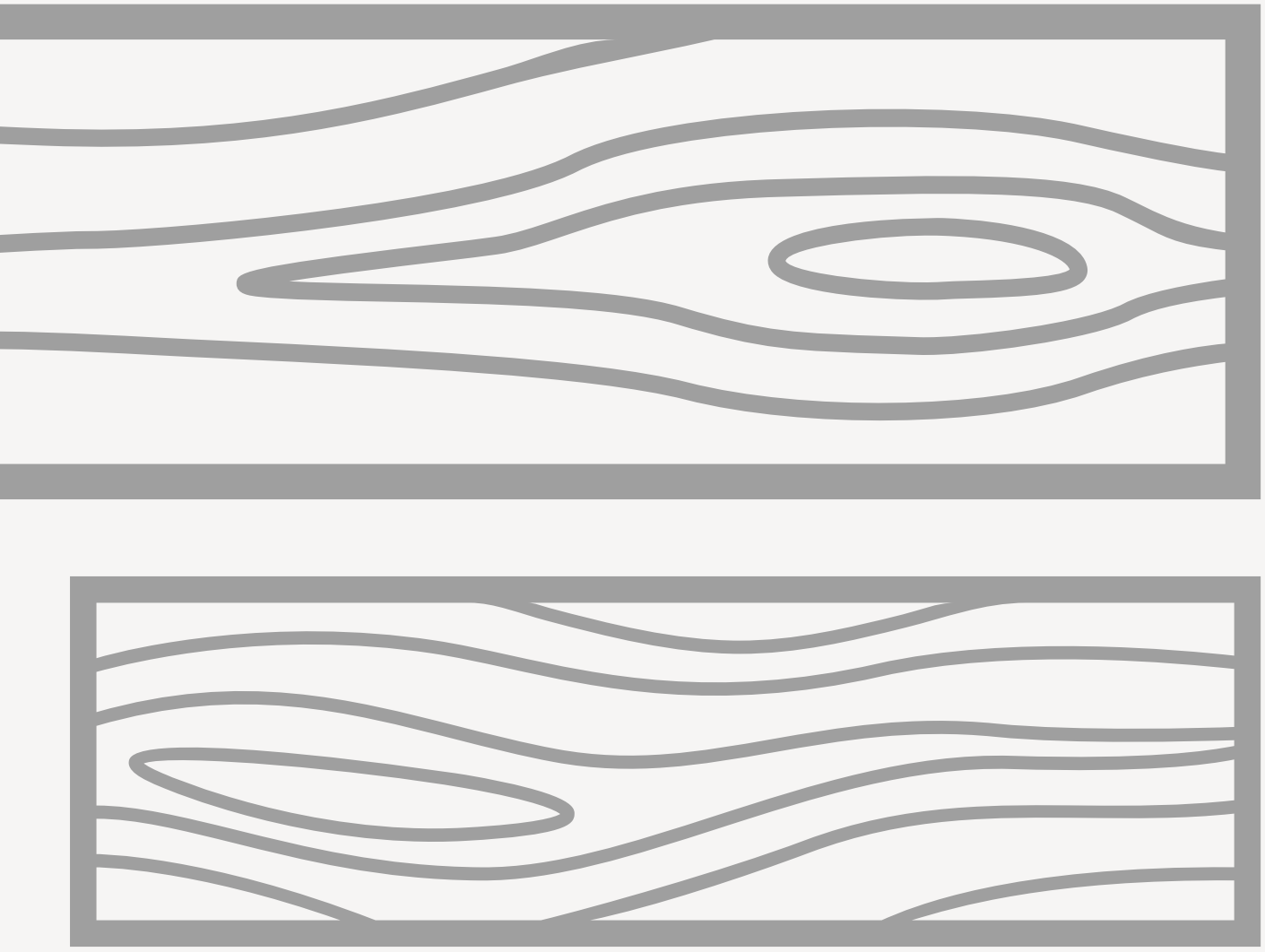
Unfold this to see the current occupational profile description and its tasks and to relate them to the following green table and first yellow table.

Tasks changes

Hazards and risks changes

Hazards and risks comments

Skills and competences needs



▲ КЪМ ИНДЕКС

Wood processing plant operator ISCO 8172

2020
Occupational profile

Current profile description
Wood processing plant operators monitor, operate and control lumber mill equipment for sawing timber logs into rough lumber, cutting veneer, making plywood and particle board, and otherwise preparing wood for further use.

- Works in accordance with basic health and safety regulations, including environmental protection and efficient energy use.
- Works in a customer-oriented manner.
- Considers cost- and time-effectiveness when planning and organizing his/her work in his/her area of influence.
- Contributes to continuous improvement of work processes in the company.
- Coordinates work with the rest of the team, report to his/her team leader.
- Cooperates with other departments (administrative, commercial and technical services).
- Assists in the implementation of quality assurance activities.

Current profiles tasks		ReSOLVE levers*																								
		Regenerate	Shift to renewable energies	Shift to renewable materials	Reclaim, retain, and regenerate health of ecosystems	Return recovered biological resources to the biosphere	**Share**	Reduce product replacement speed and increase product utilisation by sharing it among different users	Reuse products throughout their technical lifetime	Prolong products lifetime through maintenance	Prolong products lifetime through repair	Prolong products lifetime through design for durability	**Optimise**	Increase performance/efficiency of products	Customisation/made to order	Reproductible and adaptable manufacturing	Minimize waste in production and supply chain	Increase efficiency of production processes	**Loop**	Remanufacture products and/or components	Implement take-back programs	Recycle materials	Promote the cascade use of wood	Promote extraction of biochemicals from organic waste		
A	Examining logs and rough lumber to determine size, condition, quality and other characteristics to decide best lumber cuts to carry out, or operating automated equipment to convey logs through laser scanners which determine the most productive and profitable cutting patterns.			●							●	●		●	●	●	●	●		●		●	●			
B	Operating and monitoring log in-feed and conveyor systems.			●							●	●			●	●	●	●					●			
C	Preparation of the work, by removing strange elements (in metal, stone…), removing bark, etc.			●								●			●	●	●	●					●	●		
D	Operating and monitoring head saws, resaws and multiblade saws to saw logs, cants, flitches, slabs or wings and remove rough edges from sawn timber into dressed lumber of various sizes, and to saw or split shingles and shakes.			●								●		●	●	●	●	●					●	●		
E	Selecting, controlling, mounting and replacement of cutting tools on the woodworking machines.			●											●	●	●	●					●	●		
F	Operating and monitoring plywood core-laying machines and hot-plate plywood presses and machines which cut veneer.			●										●	●	●	●	●		●			●	●		
G	Cleaning and lubricating sawmill equipment.			●												●	●	●					●	●		
H				●				●	●	●	●	●		●	●	●	●	●		●	●	●	●	●		

*McKinsey center and Ellen MacArthur Foundation

Tasks changes

Current and forecasted tasks changes due to sector circular economy transition (in green for 2030) and digitalization (in blue for 2025) for the occupational profile: Wood processing plant operator - ISCO 8172

2025/30

Occupational profile

Description forecast of the occupational profile in 2030

Wood processing plant operators monitor, operate and control ecoefficient, digitized, connected and automated lumber mill equipment for sawing timber logs, coming preferably from certified sustainable sources, into rough lumber, cutting veneer, making plywood and particle board, and otherwise preparing wood for further use.

- Works in accordance with basic health and safety regulations, including environmental protection and efficient energy use.
- Uses digitization tool to work in a customer-oriented manner.
- Considers cost, environmental impact and time-effectiveness when planning and organizing his/her work in his/her area of influence.
- Contributes to continuous improvement of work processes in the company.
- Coordinates work with the rest of the team, report to his/her team leader.
- Cooperates with other departments (administrative, commercial, ICT- and technical services).
- Assists in the implementation of quality assurance and sustainability activities.
- Assists in the reduction of the environmental impact of the manufacturing, repair or remanufacturing processes (e.g. waste generation or energy use reduction, etc.).

Virtualise	Virtualise direct aspects of the product	Virtualise indirect aspects of the product	**Exchange**	Replace old materials with advanced renewable ones	Apply new technologies	Choose new products and services		**Profile tasks forecast**
		●		●	●	●	A	Examining logs and rough lumber, using fulled automated, computer vision, big data and cloud connectivity to determine size, condition, quality, source and other characteristics to decide best lumber cuts to carry out, or operate automated and ecoefficient equipment to convey logs through different sensors, like laser scanners, to determine the most productive and profitable cutting patterns, optimising the use of resources and energy and reducing to maximum the generated waste (e.g. wood scrap).
		●		●	●		B	Operating and monitoring log autonomous, ecoefficient and highly automated in-feed and conveyor systems.
		●		●	●		C	Automated, semi-automated preparation of the work, by removing strange elements (in metal, stone…), removing bark, etc., using sustainable techniques and reducing as much as possible the use of hazardous substances.
		●		●	●		D	Ecoefficient, fully automated operating and monitoring head saws, resaws and multiblade saws to saw logs, cants, flitches, slabs or wings and remove rough edges from sawn timber into dressed lumber of various sizes, and to saw or split shingles and shakes, optimising the use of wood and the generation of waste.
		●		●	●		E	Autonomous selection, controlling, mounting and replacement of cutting tools on the highly digitized connected and ecoefficient woodworking machines, optimising the use of consumables prolonging their useful life.
		●		●	●	●	F	Automated operating and remote monitoring of digitized and ecoefficient plywood core-laying machines and hot-plate plywood presses and machines which cut veneer, optimising the use of raw materials and the generation of waste.
		●		●	●		G	Data driven predictive maintenance and quality assurance through cleaning and lubricating of sawmill equipment, using substances with low environmental impact and optimising their consumption.
				●	●		H	Operating tools and digitized, connected and automated equipment for preparing wood for the maintenance, reparation and/or re-manufacturing of wood-based products, including sawing, etc.

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Wood processing plant operator ISCO 8172

2020

Occupational profile

Current profile description

Wood processing plant operators monitor, operate and control lumber mill equipment for sawing timber logs into rough lumber, cutting veneer, making plywood and particle board, and otherwise preparing wood for further use.

- Works in accordance with basic health and safety regulations, including environmental protection and efficient energy use.
- Works in a customer-oriented manner.
- Considers cost- and time-effectiveness when planning and organizing his/her work in his/her area of influence.
- Contributes to continuous improvement of work processes in the company.
- Coordinates work with the rest of the team, report to his/her team leader.
- Cooperates with other departments (administrative, commercial and technical services).
- Assists in the implementation of quality assurance activities.

New categorization of hazards

Current profiles tasks		**Mechanical hazards**	Unprotected moving parts[1]	Parts with hazardous shapes (cutting, pointed, rough)	Moving means of transport and tools[2]	Uncontrolled moving parts (flying objects, wood chips)	Slip and trips	Falls from height	**Ergonomic hazards**	Heavy loads/heavy dynamic work	Awkward position/unbalanced strain	Repetitive movements	Lack of exercise, inactivity	**Electrical hazards**	Electric shock	**Hazards due to physical effects/physical agents**	Noise	Vibration	Laserlight	**Fire and explosion hazards**	Flammable substances	**Work environment hazards**	Poor lighting conditions	Climate	Poor ventilation	**Hazards through dangerous substances**	Dust	Solvents (neurotoxic, allergens)	Carcinogens	New materials (e.g. Nanomaterials)	Recycled material	**Biological Hazards**	Non-targeted activities with microorganism	**Psychosocial hazards**	Excessive workloads	Low job satisfaction	Work tasks not clearly defined
A	Examining logs and rough lumber to determine size, condition, quality and other characteristics to decide best lumber cuts to carry out, or operating automated equipment to convey logs through laser scanners which determine the most productive and profitable cutting patterns.		●		●		●						●		●		● ●						●	●						●	●						●	
B	Operating and monitoring log in-feed and conveyor systems.				●		●						●		●		● ●	● ●					●	●		●	●										●	
C	Preparation of the work, by removing strange elements (in metal, stone...), removing bark, etc.		●	●	●	●	●			● ●	● ●				●		● ●						●	●	●		●	●								●		●	
D	Operating and monitoring head saws, resaws and multiblade saws to saw logs, cants, flitches, slabs or wings and remove rough edges from sawn timber into dressed lumber of various sizes, and to saw or split shingles and shakes.		●	●		●	●			● ●	● ●		●				● ●	● ●					●	●			●					●					●	●	
E	Selecting, controlling, mounting and replacement of cutting tools on the woodworking machines.			●			●			● ●	● ●		●				● ●	● ●					●	●												●	●	
F	Operating and monitoring plywood core-laying machines and hot-plate plywood presses and machines which cut veneer.		●	●									●		●		● ●	● ●					●	●		●				●	●					●	●	
G	Cleaning and lubricating sawmill equipment.		●				●				●		●		●		● ●			● ●			●	●		●	●	●	●	●					●	●	
H			●	●			●				●				●								●	●	●			●		●					●	●	

● No changes ● Reduced due to Circular Economy ● New or increased due to Circular Economy ● Reduced due to digitalization ● New or increased due to digitalization

Hazards and risks changes

Current and forecasted tasks changes due to sector circular economy transition (in green for 2030) and digitalization (in blue for 2025) for the occupational profile: Wood processing plant operator - ISCO 8172

	Poor organisation of work	Poorly designed workplace environment (incl. software)	Repetitive, monotonous work	Cognitive strain	Stress due to long period concentration and awareness	Increased demands on flexibility	Lack of work experience	Lack of involvement in making decisions that affect the worker	Ineffective communication, lack of support from management or colleagues	Working alone/isolation	Workload: overload/underload	Profile tasks forecast
A	●	●		●	●	●	●		●	●	●	Examining logs and rough lumber, using fulled automated, computer vision, big data and cloud connectivity to determine size, condition, quality, source and other characteristics to decide best lumber cuts to carry out, or operate automated and ecoefficient equipment to convey logs through different sensors, like laser scanners, to determine the most productive and profitable cutting patterns, optimising the use of resources and energy and reducing to maximum the generated waste (e.g. wood scrap).
B	●	●		●	●	●	●		●	●	●	Operating and monitoring log autonomous, ecoefficient and highly automated in-feed and conveyor systems.
C	●	●		●	●	●	●		●	●	●	Automated, semi-automated preparation of the work, by removing strange elements (in metal, stone…), removing bark, etc., using sustainable techniques and reducing as much as possible the use of hazardous substances.
D	●	●		●	●	●	●		●	●	●	Ecoefficient, fully automated operating and monitoring head saws, resaws and multiblade saws to saw logs, cants, flitches, slabs or wings and remove rough edges from sawn timber into dressed lumber of various sizes, and to saw or split shingles and shakes, optimising the use of wood and the generation of waste.
E	●	●		●	●	●	●		●	●	●	Autonomous selection, controlling, mounting and replacement of cutting tools on the highly digitized connected and ecoefficient woodworking machines, optimising the use of consumables prolonging their useful life.
F	●	●		●	●	●	●		●	●	●	Automated operating and remote monitoring of digitized and ecoefficient plywood core-laying machines and hot-plate plywood presses and machines which cut veneer, optimising the use of raw materials and the generation of waste.
G	●	●		●	●	●	●		●	●	●	Data driven predictive maintenance and quality assurance through cleaning and lubricating of sawmill equipment, using substances with low environmental impact and optimising their consumption.
H	●	●		●		●	●		●	●	●	Operating tools and digitized, connected and automated equipment for preparing wood for the maintenance, reparation and/or re-manufacturing of wood-based products, including sawing, etc.

2025/30 Occupational profile

Description forecast of the occupational profile in 2030

Wood processing plant operators monitor, operate and control ecoefficient, digitized, connected and automated lumber mill equipment for sawing timber logs, coming preferably from certified sustainable sources, into rough lumber, cutting veneer, making plywood and particle board, and otherwise preparing wood for further use.

- Works in accordance with basic health and safety regulations, including environmental protection and efficient energy use.
- Uses digitization tool to work in a customer-oriented manner.
- Considers cost, environmental impact and time-effectiveness when planning and organizing his/her work in his/her area of influence.
- Contributes to continuous improvement of work processes in the company.
- Coordinates work with the rest of the team, report to his/her team leader.
- Cooperates with other departments (administrative, commercial, ICT- and technical services).
- Assists in the implementation of quality assurance and sustainability activities.
- Assists in the reduction of the environmental impact of the manufacturing, repair or remanufacturing processes (e.g. waste generation or energy use reduction, etc.).

1 Cobotics (Squeezing, bumping, crushing, cutting, amputation, drawing-in/trapping).
2 Run over, roll over, falls from height.

Hazards and risks changes

Current and forecasted risks changes due to sector circular economy transition (in green for 2030) and digitalization (in blue for 2025) for the occupational profile: Wood processing plant operator - ISCO 8172

2020 Current situation	2025-30 Situation forecast
Work system/work area: working on a timber yard, saw/lumber mill, operate and control lumber mill equipment, operate machines to prepare plywood and particle wood, programming of machines, storing and transporting raw timber, handling heavy timber.	Work system/work area: working on a timber yard, saw/lumber mill, operate and control digitised and automated lumber mill equipment, operate machines to prepare plywood and particle wood, new and recycled material, programming of machines, storing and transporting raw timber, handling heavy timber, prepare wood for reuse/re-manufacture, work with ecoefficient woodworking machines.
Mechanical hazards	
• Mechanical hazards from moving machines and tools. Wood processing machinery exposes workers to risks of being injured by unprotected moving parts, contact with moving blades (saw blade, drill, kick back etc.), uncontrolled moving parts (flying objects, wood chips) and parts with hazardous shapes (cutting, pointed, rough).	• Mechanical hazards from moving machines and tools. Wood processing machinery exposes workers to risks of being injured by unprotected moving parts, contact with moving blades (saw blade, drill, kick back etc.), uncontrolled moving parts (flying objects, wood chips) and parts with hazardous shapes (cutting, pointed, rough), and from moving cobots and robots. Some risks from mechanical hazards may decrease, depending on takeover of specific tasks by cobots/robots. Most of industrial cobots and robots are unaware of their surroundings therefore they can be dangerous to workers. Industrial robots can pose several types of hazards based on their origin: Mechanical hazards such as those arising from unintended and unexpected movements or release of tools. Preparing wood for reuse/remanufacturing may require new type of tools not available. Better design of products (ecodesign) could reduce hazards associated to activities on a timber yard, saw/lumber mill – using wood processing machines.
Effects: severe bruises, amputations, cuts and sharp injuries, crushing.	**Effects**: severe bruises, amputations, cuts and sharp injuries, crushing.
• Slips and trips, obstacles, table edges, moving vehicles, machines.	• Slips and trips, obstacles, table edges, moving vehicles, machines.
Effects: squeezing, cutting, twisting, spraining, bumps and bruises.	**Effects**: squeezing, cutting, twisting, spraining, bumps and bruises.
Ergonomic hazards	
• Ergonomic hazards: from poor ergonomic conditions, awkward positions, heavy physical workload.	• Ergonomic hazards: from poor ergonomic conditions, awkward positions, heavy physical workload, digitalization put workers at risk of inactivity because of operating autonomous techniques from office workstations. Risks from ergonomic hazards may decrease, depending on take over of specific task by cobots/robots. On the other hand, workers are increasingly exposed to ergonomic hazards such as lack of exercise/inactivity because of operating autonomous machines and cobots from computer workstations. Inactivity may increase with digitalization. Preparing wood for reuse and reassembling may be related to Musculoskeletal Disorders (MSDs) (e.g. awkward positions, heavy lifting and carrying). This risk could be reduced with ecodesign strategies if occupational safety and health is taken into account when designing the product.
Effect: musculoskeletal diseases.	**Effect**: musculoskeletal diseases.
Electrical hazards	
• Electrical hazards: caused by contact with defective or unearthed electrical equipment.	• Electrical hazards: caused by contact with defective or unearthed electrical equipment and from autonomous or highly autonomous equipment.
Effect: fatal accident.	**Effect**: fatal accident.
Hazards due to physical effects/physical agents	
• Noise	• Noise: exposure to noise may decrease, depending on takeover of specific tasks by cobots/robots. The risk could be reduced with ecodesign strategies if occupational safety and health is taken into account when designing the product and machines.
Effects: hearing loss, headache, nervousness, poor concentration.	**Effects**: hearing loss, headache, nervousness, poor concentration.
• Vibrations	• Vibrations: exposure to vibration may decrease, depending on takeover of specific tasks by cobots/robots. The risk could be reduced with ecodesign strategies if occupational safety and health is taken into account when designing the product and machines.
Effects: hand-arm-vibration syndrome (e.g. white finger disease).	**Effects**: hand-arm-vibration syndrome (e.g. white finger disease).
• Laserlight	• Laserlight: wood processing plant operators may be exposed to laserlight.
Effect: eye damage, effects similar to sunburn.	**Effect**: eye damage, effects similar to sunburn.

2020 Current situation	2025-30 Situation forecast
Fire and explosion hazards	
• Fire and explosion hazards from materials, including wood dust and chemicals.	• Fire and explosion hazards from materials, including wood dust and chemicals. Exposure to fire and explosion hazards may decrease, depending on takeover of specific tasks by cobots/robots. Solvents and cleaning products used for maintenance tasks may be based on less hazardous substances (e.g. solvents) and prevent fire hazards.
Effects: burns, fatal accidents.	**Effects**: burns, fatal accidents.
Work environmental hazards	
• Work environmental hazards: poor lighting, inadequate temperature and climate.	• Work environmental hazards: poor lighting, inadequate temperature and climate.
Effect: negative effects on muscles, tendons and joints, cold, poor concentration, eye strain.	**Effect**: negative effects on muscles, tendons and joints, cold, poor concentration, eye strain.
Hazards through dangerous substances	
• Chemical hazards/dangerous substances: wood dust, preservatives, formaldehyde.	• Chemical hazards/dangerous substances: wood dust, preservatives, formaldehyde. The risk of being exposed to chemicals may decrease, depending on takeover of specific tasks by cobots/robots. Maybe reduced, if OSH will be included in the design of the products/ materials, less dangerous solvents and lubricants.
Effects: contamination/intoxication, skin diseases, respiratory diseases, wood dusts (carcinogens, allergens) may cause nasal or lung cancer.	**Effects**: contamination/intoxication, skin diseases, respiratory diseases, wood dusts (carcinogens, allergens) may cause nasal or lung cancer.
	• New materials (e.g. nanomaterials): Nanotechnology and nanomaterials may be used in woods as well as wood-composite materials in order to improve some of their properties, e.g. to improve the water resistance or thermal conductivity. **Effects**: not yet well known, included are among others inflammation and tissue damage, fibrosis and tumour generation.
	• Recycled material may concentrate hazardous substances (impurities) during successive recycling or may change the composition due to different factors such as light, heat and aging of material unknown content and kind of hazardous substances. Recycled material may contain dangerous substances, to the latest findings carcinogen or repro-toxic. (nowadays restricted by law (REACH)). **Effects**: contamination/intoxication, skin diseases, respiratory diseases, allergies, cancer.
Psychosocial hazards	
• Organisation of work: time pressure, lack of experience, training and information, increased demand on flexibility, repetitive, monotonous work.	• Organisation of work: time pressure, lack of experience, training and information, increased demand on flexibility and digital know how, repetitive, monotonous work. Lack of experience: New software and digital devices require training, some workers may not have enough competences and may feel overloaded, not experienced enough. Increased demand on competences and up-to-date knowledge on the current development in circular economy and recycling industry. Working with materials which have previously been manufactured: new skills need to be acquired throughout the production cycle.
• Social relationship: lack of involvement in making decisions that affect the worker, difficult colleagues.	• Social relationship: lack of involvement in making decisions that affect the worker, difficult colleagues, lack of social contacts.
• Working method: working with colleagues.	• Working method: working with colleagues, autonomous machines/equipment, cognitive interactions with autonomous technologies. The use of cobots and other digital techniques may increase the risk of working alone and feeling isolated. Cognitive interactions between a robot and a human worker can lead to mental stress. Long period of concentration working with computer and new software and performing multitasking. Increased demand on flexibility as workers may perform some tasks from everywhere with mobile devices. Workers are also at risk of being permanent available outside working hours.
Effects: stress, burnout.	**Effects**: stress, burnout.

Skills and competences needs

Forecast of training new needs due to sector circular economy transition (in green for 2030) and digitalization (in blue for 2025) for the occupational profile: Wood processing plant operator - ISCO 8172

Skills, knowledge and competences	Will it continue to be needed?	Main causes/reasons of change: Shift to renewable materials	Reproductible and adaptable manufacturing	Minimize waste in production and supply chain	Increase efficiency of production processes	Recycle materials	Replace old materials with advanced renewable ones	Apply new technologies	Operating digitized, connected and fully automated/autonomous machines	Use of computer vision, big data and cloud connectivity	Using remote monitoring and data driven predictive maintenance and quality assurance
Essential skills and competences											
Adjust properties of cut	YES, changed	●				●	●	●	●		
Create cutting plan	YES, changed	●	●	●	●	●	●	●	●		
Dispose of cutting waste material	YES, changed	●		●		●		●			
Ensure conformity to specifications	YES, changed	●				●	●			●	●
Ensure equipment availability	YES										
Handle timber	YES, changed			●		●		●			
Handle timber-based products	YES, changed			●		●		●			
Keep sawing equipment in good condition	YES, changed									●	●
Manipulate wood	YES, changed			●		●		●	●	●	
Monitor automated machines	YES										
Operate wood sawing equipment	YES, changed			●		●		●	●	●	
Perform test run	NO										
Remove inadequate workpieces	YES, changed			●		●					
Remove processed workpiece	NO										
Supply machine	YES										
Troubleshoot	YES, changed									●	●
Wear appropriate protective gear	YES										
Work safely with machines	YES										
Disassemble wood-based furniture products	NEW	●	●	●		●	●		●		
Examine disassembled pieces for further steps (reuse, recylce, upcycle)	NEW	●	●	●	●	●	●	●	●	●	●
Repair wood-based furniture pieces, where needed	NEW	●	●	●	●	●	●	●	●		●
Essential knowledge											
Cutting technologies	YES										
Types of wood	YES, changed	●		●		●	●				
Wood cuts	YES										
Woodworking processes	YES, changed	●	●	●	●		●	●	●	●	
Generic green skills, knowledge and competences (*)											
Environmental awareness and willingness to learn	NEW	●	●	●	●	●	●	●			
Systems and risk analysis skills	NA										
Innovation skills	NA										
Coordination, management and business skills	NA										
Communication and negotiation skills	NA										
Marketing skills	NA										
Strategic and leadership skills	NA										
Consulting skills	NA										
Networking, information technology and language skills	NA										
Adaptability and transferability skills	NEW	●	●	●	●	●	●	●			
Entrepreneurial skills	NA										
Waste, energy and water quantification and monitoring	NEW		●	●	●			●			
Material use and impact quantification and monitoring	NEW	●	●	●	●	●	●	●			
Material use and impact minimisation	NEW	●	●	●	●	●	●				

(*) Source: Strietskallina et al. and Dr. Margarita Pavlova

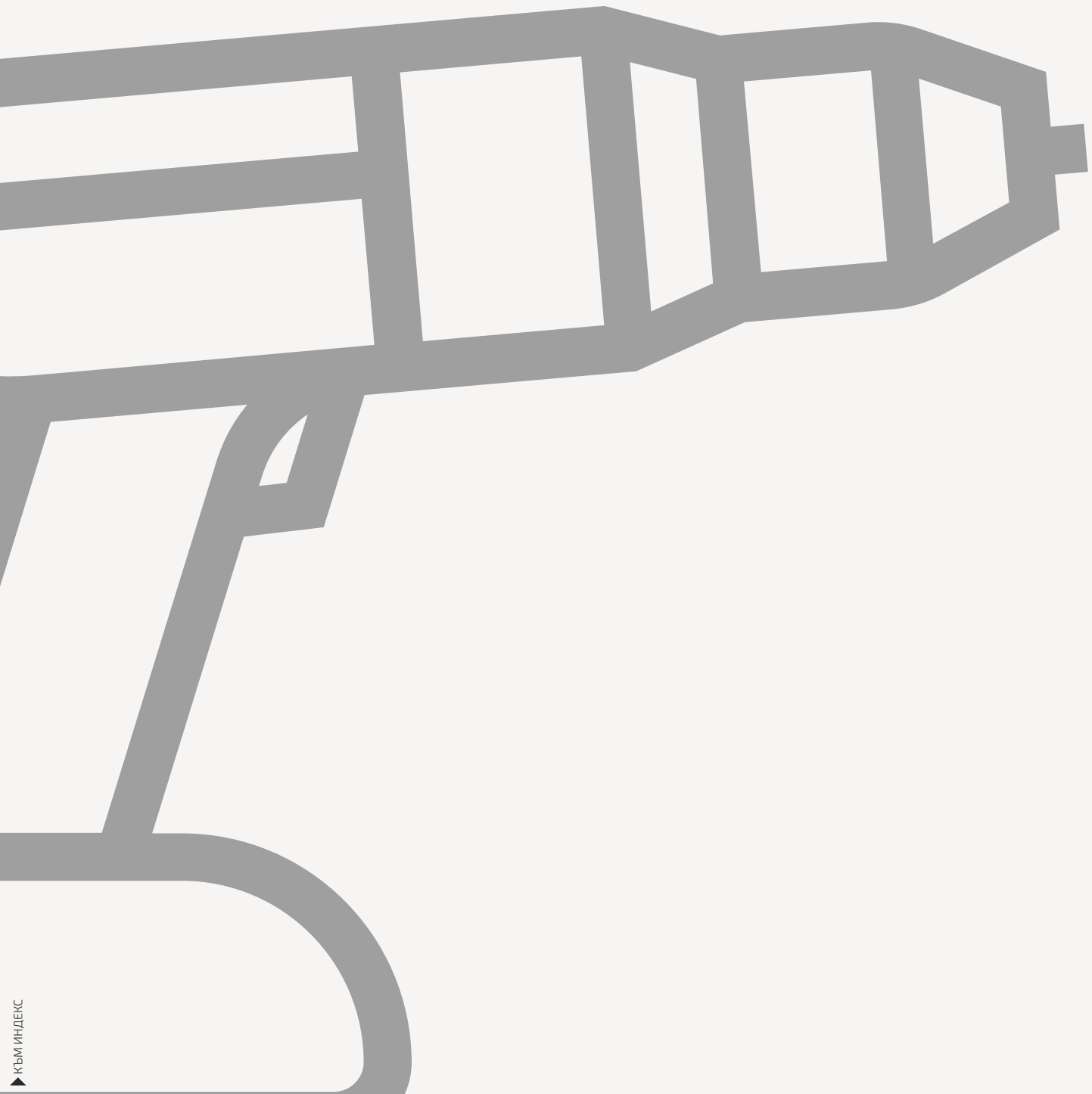
Furniture assembler
ISCO 8219s

You will find three different types of tables for each occupational profile, where the forecasted changes due to sector circular economy transition are in green colour and due to sector digitalization are in blue colour.

Tasks changes
Current and forecasted tasks changes.

Hazards and risks changes
Current and forecasted risks changes.

Skills and competences need
Forecast of training new needs.



КЪМ ИНДЕКС

Furniture assembler
ISCO 8219s

Unfold this to see the current occupational profile description and its tasks and to relate them to the following green table and first yellow table.

Tasks changes

Hazards and risks changes

Hazards and risks comments

Skills and competences needs

Furniture assembler
ISCO 8219s

2020
Occupational profile

Current profile description
Furniture assemblers place together all parts of furniture and auxiliary items such as furniture legs and cushions. They may also fit springs or special mechanisms. Furniture assemblers follow instructions or blueprints to assemble the furniture, and use hand tools and power tools.

- Works in accordance with basic health and safety regulations, including environmental protection and efficient energy use.
- Works in a customer-oriented manner.
- Considers cost- and time-effectiveness when planning and organizing his/her work in his/her area of influence.
- Contributes to continuous improvement of work processes in the company.
- Coordinates work with the rest of the team, report to his/her team leader.
- Cooperates with other departments (administrative, commercial and technical services).
- Assists in the implementation of quality assurance activities.

Current profiles tasks		ReSOLVE levers*																									
		Regenerate	Shift to renewable energies	Shift to renewable materials	Reclaim, retain, and regenerate health of ecosystems	Return recovered biological resources to the biosphere	**Share**	Reduce product replacement speed and increase product utilisation by sharing it among different users	Reuse products throughout their technical lifetime	Prolong products lifetime through maintenance	Prolong products lifetime through repair	Prolong products lifetime through design for durability	**Optimise**	Increase performance/efficiency of products	Customisation/made to order	Reproductible and adaptable manufacturing	Minimize waste in production and supply chain	Increase efficiency of production processes	**Loop**	Remanufacture products and/or components	Implement take-back programs	Recycle materials	Promote the cascade use of wood	Promote extraction of biochemicals from organic waste		
A	Reviewing work orders, specifications, diagrams and drawings to determine materials needed and assembly instructions. • Fixed assembling with glue, screws, nails, fasteners and demountable assembling. • Finishing of the surfaces (filling up nail holes…). • Small corrections and reparations. • Mounting and adjusting fasteners and special hinges, rails…			●				●	●	●	●	●		●	●	●	●	●		●		●	●				
B	Reviewing work orders, specifications, diagrams and drawings to determine materials needed and assembly instructions.			●				●	●	●	●	●		●	●	●	●	●		●	●	●	●				
C	Recording production and operatio-nal data on specified forms.														●	●	●	●									
D	Inspecting and testing components and completed assemblies.			●				●	●	●	●	●		●	●	●	●	●		●	●	●	●				
E	Rejecting faulty products.			●											●	●	●	●		●	●	●	●				
F				●				●						●		●	●				●	●	●	●			
G				●				●	●	●	●	●		●	●	●	●	●		●	●	●	●				

*McKinsey center and Ellen MacArthur Foundation

Tasks changes

Current and forecasted tasks changes due to sector circular economy transition (in green for 2030) and digitalization (in blue for 2025) for the occupational profile: Furniture assembler - ISCO 8219s

2025/30

Occupational profile

Description forecast of the occupational profile in 2030

Furniture assemblers place together all parts of furniture and auxiliary items such as furniture legs and cushions. They may also fit springs or special mechanisms. Furniture assembling is done by joint cooperation between robots and humans using cobots and sometimes it is significantly automated eventually into a fully autonomous process using cobots, big data and industrial IoT.

- Works in accordance with basic health and safety regulations, including environmental protection and efficient energy use.
- Uses digitization tools to work in a customer-oriented manner.
- Considers cost, environmental impact and time-effectiveness when planning and organizing his/her work in his/her area of influence.
- Contributes to continuous improvement of work processes in the company.
- Coordinates work with the rest of the team, report to his/her team leader.
- Cooperates with other departments (administrative, commercial, ICT- and technical services).
- Assists in the implementation of quality assurance and sustainability activities.
- Assists in the reduction of the environmental impact of the manufacturing, repair, remanufacturing or recycling processes (e.g. waste generation or energy use reduction, etc.).
- Applies a life-cycle thinking and favours the future disassembly of the product for maintenance, repair, reuse or recycling.

	Virtualise	Virtualise direct aspects of the product	Virtualise indirect aspects of the product	**Exchange**	Replace old materials with advanced renewable ones	Apply new technologies	Choose new products and services	**Profile tasks forecast**
A			•		•	•	•	Semi-autonomous review of work orders jointly between humans and advanced artificial intelligence, based on computer vision, specifications, diagrams and drawings to determine materials needed and assembly instructions. • Fixed assembling with glue, screws, nails, fasteners and demountable assembling. • Finishing of the surfaces (filling up nail holes…). • Small corrections and reparations. • Mounting and adjusting fasteners and special hinges, rails… • Considering the future disassembly of the product for maintenance, repair, refurbishment or recycling (e.g. reducing glued components).
B			•		•	•	•	Reviewing work orders, specifications, diagrams and drawings to determine materials needed and assembly instructions of the highly digitised enterprise ecosystem, optimising also the future disassembly of the product for repair, refurbishment or recycling.
C			•			•		Recording production and operational data of the highly digitised and ecoefficient manufacturing plant on specified digitilized forms, including environmental performance indicators.
D			•			•		Inspecting and testing components and completed assemblies to fulfill quality and circular economy-oriented requirements (e.g. disassembly sequence for maintenance, repair, etc.) as integrated part of the fully digitised smart manufacturing ecosystem of the company.
E			•			•		Supervising the highly autonomous rejection system of faulty products, reducing as much as possible the scrap generated and promoting the internal reuse of part or components.
F					•			Defining and following disassembly instructions for selective disassembling of out of use or defective wood-based products for separation of materials and elements for further recovery or recycling.
G					•	•	•	Defining and following intructions for the maintenance, reparation and/or re-manufacturing of wood-based products, including re-assembly and final quality inspection and testing.

Furniture assembler
ISCO 8219s

2020
Occupational profile

Current profile description
Furniture assemblers place together all parts of furniture and auxiliary items such as furniture legs and cushions. They may also fit springs or special mechanisms. Furniture assemblers follow instructions or blueprints to assemble the furniture, and use hand tools and power tools.

- Works in accordance with basic health and safety regulations, including environmental protection and efficient energy use.
- Works in a customer-oriented manner.
- Considers cost- and time-effectiveness when planning and organizing his/her work in his/her area of influence.
- Contributes to continuous improvement of work processes in the company.
- Coordinates work with the rest of the team, report to his/her team leader.
- Cooperates with other departments (administrative, commercial and technical services).
- Assists in the implementation of quality assurance activities.

Current profiles tasks

		Mechanical hazards	Unprotected moving parts[1]	Parts with hazardous shapes (cutting, pointed, rough)	Moving means of transport and tools[2]	Uncontrolled moving parts (flying objects, wood chips)	Slip and trips	Falls from height	**Ergonomic hazards**	Heavy loads/heavy dynamic work	Awkward position/unbalanced strain	Repetitive movements	Lack of exercise, inactivity	**Electrical hazards**	Electric shock	**Hazards due to physical effects/physical agents**	Noise	Vibration	Laserlight	**Fire and explosion hazards**	Flammable substances	**Work environment hazards**	Poor lighting conditions	Climate	Poor ventilation	**Hazards through dangerous substances**	Dust	Solvents (neurotoxic, allergens)	Carcinogens	New materials (e.g. Nanomaterials)	Recycled material	**Biological Hazards**	Non-targeted activities with microorganism	**Psychosocial hazards**	Excessive workloads	Low job satisfaction	Work tasks not clearly defined
A	Reviewing work orders, specifications, diagrams and drawings to determine materials needed and assembly instructions. • Fixed assembling with glue, screws, nails, fasteners and demountable assembling. • Finishing of the surfaces (filling up nail holes…). • Small corrections and reparations. • Mounting and adjusting fasteners and special hinges, rails…		●	●		●	●			●	●	●	●				● ●	● ●	●		● ●		●	●	●			●	●	●	●				●		●
B	Reviewing work orders, specifications, diagrams and drawings to determine materials needed and assembly instructions.						●						●										●	●	●										●		●
C	Recording production and operational data on specified forms.												●										●	●											●		●
D	Inspecting and testing components and completed assemblies.		●				●						●				● ●						●	●						●	●				●		●
E	Rejecting faulty products.		●				●						●				● ●						●	●											●		●
F			●	●	●		●			●				●		●	●						●	●	●		●			●	●		●		●		●
G			●	●	●		●			●				●		●	●						●	●	●		●			●	●		●		●		●

New categorization of hazards

● No changes ● Reduced due to Circular Economy ● New or increased due to Circular Economy ● Reduced due to digitalization ● New or increased due to digitalization

Hazards and risks changes

Current and forecasted tasks changes due to sector circular economy transition (in green for 2030) and digitalization (in blue for 2025) for the occupational profile: Furniture assembler - ISCO 8219s

2025/30

Occupational profile

Description forecast of the occupational profile in 2030

Furniture assemblers place together all parts of furniture and auxiliary items such as furniture legs and cushions. They may also fit springs or special mechanisms. Furniture assembling is done by joint cooperation between robots and humans using cobots and sometimes it is significantly automated eventually into a fully autonomous process using cobots, big data and industrial IoT.

- Works in accordance with basic health and safety regulations, including environmental protection and efficient energy use.
- Uses digitization tools to work in a customer-oriented manner.
- Considers cost, environmental impact and time-effectiveness when planning and organizing his/her work in his/her area of influence.
- Contributes to continuous improvement of work processes in the company.
- Coordinates work with the rest of the team, report to his/her team leader.
- Cooperates with other departments (administrative, commercial, ICT- and technical services).
- Assists in the implementation of quality assurance and sustainability activities.
- Assists in the reduction of the environmental impact of the manufacturing, repair, remanufacturing or recycling processes (e.g. waste generation or energy use reduction, etc.).
- Applies a life-cycle thinking and favours the future disassembly of the product for maintenance, repair, reuse or recycling.

	Poor organisation of work	Poorly designed workplace environment (incl. software)	Repetitive, monotonous work	Cognitive strain	Stress due to long period concentration and awareness	Increased demands on flexibility	Lack of work experience	Lack of involvement in making decisions that affect the worker	Ineffective communication, lack of support from management or colleagues	Working alone/isolation	Workload: overload/underload	**Profile tasks forecast**
A	●	●		●	●	●	●	●	●	●	●	Semi-autonomous review of work orders jointly between humans and advanced artificial intelligence, based on computer vision, specifications, diagrams and drawings to determine materials needed and assembly instructions. • Fixed assembling with glue, screws, nails, fasteners and demountable assembling. • Finishing of the surfaces (filling up nail holes…). • Small corrections and reparations. • Mounting and adjusting fasteners and special hinges, rails… • Considering the future disassembly of the product for maintenance, repair, refurbishment or recycling (e.g. reducing glued components).
B	●	●		●	●	●	●		●	●	●	Reviewing work orders, specifications, diagrams and drawings to determine materials needed and assembly instructions of the highly digitised enterprise ecosystem, optimising also the future disassembly of the product for repair, refurbishment or recycling.
C	●	●		●	●	●	●		●	●	●	Recording production and operational data of the highly digitised and ecoefficient manufacturing plant on specified digitilized forms, including environmental performance indicators.
D	●	●		●	●	●	●			●	●	Inspecting and testing components and completed assemblies to fulfill quality and circular economy-oriented requirements (e.g. disassembly sequence for maintenance, repair, etc.) as integrated part of the fully digitised smart manufacturing ecosystem of the company.
E	●	●		●	●	●	●			●	●	Supervising the highly autonomous rejection system of faulty products, reducing as much as possible the scrap generated and promoting the internal reuse of part or components.
F	●	●				●	●				●	Defining and following disassembly instructions for selective disassembling of out of use or defective wood-based products for separation of materials and elements for further recovery or recycling.
G	●	●				●	●				●	Defining and following intructions for the maintenance, reparation and/or re-manufacturing of wood-based products, including re-assembly and final quality inspection and testing.

1 Cobotics (Squeezing, bumping, crushing, cutting, amputation, drawing-in/trapping).
2 Run over, roll over, falls from height.

Hazards and risks changes

Current and forecasted risks changes due to sector circular economy transition (in green for 2030) and digitalization (in blue for 2025) for the occupational profile: Furniture assembler - ISCO 8219s

2020 Current situation	2025-30 Situation forecast
Work system/work area: working on site, operate wood processing machines, use of hand and power tools to place together furniture and auxiliary items.	Work system/work area: working on site, operate wood processing machines, use of hand and power tools, cobots and other digital machines to place together furniture and auxiliary items, following instructions circular and economic oriented requirements, using less dangerous substances (glue, solvents, coatings), using new and recycled material. Disassemble, dismantle, repair and maintenance of products.
Mechanical hazards	
• Mechanical hazards from moving machines and tools. Machinery used to assemble furniture exposes workers to risks of being injured by unprotected moving parts, uncontrolled moving parts (air tools/electric staplers, springs) and parts with hazardous shapes (cutting, pointed, rough).	• Mechanical hazards from moving machines and tools. Machinery used to assemble furniture exposes workers to risks of being injured by unprotected moving parts, uncontrolled moving parts (air tools/electric staplers, springs) and parts with hazardous shapes (cutting, pointed, rough), and from cobots and robots. Some risks from mechanical hazards may decrease, depending on takeover of specific tasks by cobots/robots. However, most of industrial cobots and robots are unaware of their surroundings therefore they can be dangerous to workers. Industrial robots can pose several types of hazards based on their origin: Mechanical hazards such as those arising from unintended and unexpected movements or release of tools. Remanufacturing and selective disassembling could require new type of tools not available. Better design of products (ecodesign) could reduce hazards associated to assembly/disassembly operations, using optimised joining systems, etc.
Effects: severe bruises, cuts and sharp injuries.	**Effects**: severe bruises, cuts and sharp injuries.
• Slips and trips, obstacles, table edges.	• Slips and trips, obstacles, table edges.
Effects: squeezing, cutting, twisting, spraining, bumps and bruises.	**Effects**: squeezing, cutting, twisting, spraining, bumps and bruises.
Ergonomic hazards	
• Ergonomic hazards: from poor ergonomic conditions, awkward positions, heavy physical workload.	• Ergonomic hazards: from poor ergonomic conditions, awkward positions, heavy physical workload. Risks from ergonomics hazards such as heavy load may decrease, depending on takeover of specific task by cobots/robots. On the other hand, workers may be increasingly exposed to ergonomic hazards such as lack of exercise/inactivity because of operating autonomous machines and cobots from computer workstations. The disassembling and dismantling of manufactured goods may be related to Musculoskeletal Disorders (MSDs) (e.g. awkward positions, heavy lifting and carrying). This risk could be reduced with ecodesign strategies to facilitate assembly/disassembly (e.g. type of fasteners, etc.) if occupational safety and health is taken into account when designing the product.
Effect: musculoskeletal diseases.	**Effect**: musculoskeletal diseases.
Electrical hazards	
• Electrical hazards: contacts with live parts or connections or exposure to arc flash. Electrical hazards from woodworking machines.	• Electrical hazards: contacts with live parts or connections or exposure to arc flash. Electrical hazards from woodworking machines and from autonomous or highly autonomous equipment.
Effect: fatal accident.	**Effect**: fatal accident.
Hazards due to physical effects/physical agents	
• Noise	• Noise: exposure to noise may decrease, depending on takeover of specific tasks by cobots/robots. Noise maybe reduced due to ecodesign of machinery operating quieter and more environmental-friendly. However, dismantling activities may expose workers still to noise.
Effects: hearing loss, headache, nervousness, poor concentration.	**Effects**: hearing loss, headache, nervousness, poor concentration.
• Vibrations	• Vibrations: exposure to vibration may decrease, depending on takeover of specific tasks by cobots/robots. Possible more use of vibrating tools during product remanufacturing or repair (polisher, etc.). Vibration maybe reduced due to ecodesign of machinery operating with less vibration energy and more environmental-friendly.
Effect: hand-arm-vibration syndrome (e.g. white finger disease).	**Effect**: hand-arm-vibration syndrome (e.g. white finger disease).
• Laserlight	• Laserlight: furniture assembler may be exposed to laserlight.
Effects: eye damage, negative effects similar to sunburn.	**Effects**: eye damage, negative effects similar to sunburn.
Fire and explosion hazards	
• Fire and explosion hazards from materials, including wood dust, solvents and chemicals.	• Fire and explosion hazards from materials, including wood dust, solvents and chemicals. Exposure to fire and explosion hazards may decrease, depending on takeover of specific tasks by cobots/robots. Dust maybe emitted during dismantling, remanufacturing or repair activities– inappropriate dust extraction system increases risk of dust explosion. Risk from explosion and fire may decrease, depending on the substitution of flammable solvents in glues.
Effects: burns, fatal accidents.	**Effects**: burns, fatal accidents.

2020 Current situation	2025-30 Situation forecast
Work environmental hazards	
• Work environmental hazards: poor lighting, inadequate temperature and climate, poor ventilation.	• Work environmental hazards: poor lighting, inadequate temperature and climate, poor ventilation.
Effect: negative effects on muscles, tendons and joints, cold, poor concentration, eye strain.	**Effect**: negative effects on muscles, tendons and joints, cold, poor concentration, eye strain.
Hazards through dangerous substances	
• Chemical hazards/dangerous substances: wood dust, solvents, preservatives, formaldehyde, glues, new substances/materials.	• Chemical hazards/dangerous substances: wood dust, solvents, preservatives, formaldehyde, glues, new substances/materials. Chemical risks may decrease, depending on takeover of specific task by cobots/robots. Chemical hazards may be reduced, if OSH will be included in the design of the products/ materials (use of less dangerous substances) and if dangerous substances will be substituted by less dangerous substances (solvents, glues, formaldehyde). Chemical hazards may increase depending on the quality of recycled materials (during successive recycling of unknown raw materials). Disassembling, dismantling: Exposure to fibres or dust when disassembling, dismantling products.
Effects: contamination/intoxication, skin diseases, respiratory diseases, allergies, cancer.	**Effects**: contamination/intoxication, skin diseases, respiratory diseases, allergies, cancer.
	• New materials (e.g. nanomaterials): Nanotechnology and nanomaterials may be used in woods as well as wood-composite materials in order to improve some of their properties, e.g. to improve the water resistance or thermal conductivity. **Effects**: not yet well known, included are among others inflammation and tissue damage, fibrosis and tumour generation.
	• Recycled material: Risk of exposure to dangerous substances may be increased through lack of information on chemicals contained in recycled products and on ways how to deal with them appropriately. Recycled material may contain dangerous substances, to the latest findings carcinogen or repro-toxic. (nowadays restricted by law (REACH)). **Effects**: contamination/intoxication, skin diseases, respiratory diseases, cancer.
Biological hazards	
• Biological hazards: bacteria, mould and fungi.	• Non-targeted activities with microorganism: selective and/or destructive disassembling for separation of materials and elements for further recovery or recycling may expose workers to microorganism such as mould (Recycled , old and used material may contain mould).
Effects: contamination/intoxication, skin diseases, respiratory diseases, infections.	**Effects**: contamination/intoxication, skin diseases, respiratory diseases, infections.
Psychosocial hazards	
• Organisation of work: time pressure, lack of experience, training and information, increased demand on flexibility, repetitive and monotonous work.	• Organisation of work: time pressure, lack of experience, training and information, increased demand on flexibility and digital know how, repetitive and monotonous work.
	• Lack of experience: New software and digital devices require training, some workers may not have enough competences and may feel overloaded, not experienced enough. Increased demand on competences and up-to-date knowledge on the current development in circular economy and recycling industry. Working with materials which have previously been manufactured: new skills need to be acquired throughout the production cycle. Repair, remanufacture and selective disassembly require new methods and procedures.
• Social relationship: lack of involvement in making decisions that affect the worker, difficult colleagues.	• Social relationship: lack of involvement in making decisions that affect the worker, difficult colleagues, lack of social contacts.
• Working method: working with colleagues.	• Working method: working with colleagues, digital equipment, cognitive interactions with autonomous equipment. The use of cobots and other digital techniques may increase the risk of working alone and feeling isolated. Cognitive interactions between a robot and a human worker can lead to mental stress. Long period of concentration working with computer and new software and performing multitasking. Increased demand on flexibility as workers may perform some tasks from everywhere with mobile devices. Workers are also at risk of being permanent available outside working hours.
Effects: stress, burnout	**Effects**: stress, burnout, and emotional distress, suffering from depression, cardiovascular problems, sleep disorders.

Skills and competences needs

Forecast of training new needs due to sector circular economy transition (in green for 2030) and digitalization (in blue for 2025) for the occupational profile: Furniture assembler - ISCO 8219s

Skills, knowledge and competences	Will it continue to be needed?	Main causes/reasons of change: Shift to renewable materials	Customisation/made to order	Reproductible and adaptable manufacturing	Minimize waste in production and supply chain	Increase efficiency of production processes	Recycle materials	Promote the cascade use of wood	Apply new technologies	Furniture assembling is done by joint cooperation between robots and humans using cobots, big data and industrial IoT	Working in a highly digitized smart manufacturing ecosystem, with digitilized forms	Working as an integrated part of the fully digitized ecosystem of the company
Essential skills and competences												
Align components	YES, changed									●		
Apply a protective layer	YES, changed	●	●						●			
Assemble prefabricated furniture	YES, changed	●	●				●	●	●	●		
Clean wood surface	YES, changed	●			●		●		●			
Create furniture frames	YES, changed	●	●	●	●		●	●	●			
Create smooth wood surface	YES, changed	●	●						●			
Ensure conformity to specifications	YES, changed	●				●	●	●	●		●	
Follow written instructions	YES, changed									●	●	
Join wood elements	YES, changed	●	●	●	●		●	●	●	●		
Memorise assembly instructions	NO											
Operate drilling equipment	YES, changed									●		
Tend boring machine	YES, changed									●		
Use power tools	YES, changed									●		
Disassemble wood-based furniture products	NEW				●		●	●	●	●		
Examine disassembled pieces for further steps (reuse, recylce, upcycle)	NEW				●		●	●			●	
Repair wood-based furniture pieces, where needed	NEW			●	●		●	●	●	●		
Essential knowledge												
Technical drawings	YES, changed										●	
Generic green skills, knowledge and competences (*)												
Environmental awareness and willingness to learn	NEW	●	●	●	●	●	●	●	●			
Systems and risk analysis skills	NA											
Innovation skills	NA											
Coordination, management and business skills	NA											
Communication and negotiation skills	NA											
Marketing skills	NA											
Strategic and leadership skills	NA											
Consulting skills	NA											
Networking, information technology and language skills	NA											
Adaptability and transferability skills	NEW	●	●	●	●	●	●	●	●			
Entrepreneurial skills	NA											
Waste, energy and water quantification and monitoring	NEW	●		●	●	●		●	●			
Material use and impact quantification and monitoring	NEW	●		●	●	●	●	●	●			
Material use and impact minimisation	NEW	●	●		●	●	●	●	●			

(*) Source: Strietskallina et al. and Dr. Margarita Pavlova

Factory hand
ISCO 9329

You will find three different types of tables for each occupational profile, where the forecasted changes due to sector circular economy transition are in green colour and due to sector digitalization are in blue colour.

Tasks changes
Current and forecasted tasks changes.

Hazards and risks changes
Current and forecasted risks changes.

Skills and competences need
Forecast of training new needs.

Factory hand
ISCO 9329

Unfold this to see the current occupational profile description and its tasks and to relate them to the following green table and first yellow table.

Tasks changes

Hazards and risks changes

Hazards and risks comments

Skills and competences needs

КЪМ ИНДЕКС

Factory hand
ISCO 9329

2020
Occupational profile

Current profile description
Factory hands assist machine operators and product assemblers. They clean the machines and the working areas. Factory hands make sure supplies and materials are replenished.

- Works in accordance with basic health and safety regulations, including environmental protection and efficient energy use.
- Works in a customer-oriented manner.
- Considers cost- and time-effectiveness when planning and organizing his/her work in his/her area of influence.
- Contributes to continuous improvement of work processes in the company.
- Coordinates work with the rest of the team, report to his/her team leader.
- Cooperates with other departments (administrative, commercial and technical services).
- Assists in the implementation of quality assurance activities.

Current profiles tasks		ReSOLVE levers*	Regenerate	Shift to renewable energies	Shift to renewable materials	Reclaim, retain, and regenerate health of ecosystems	Return recovered biological resources to the biosphere	Share	Reduce product replacement speed and increase product utilisation by sharing it among different users	Reuse products throughout their technical lifetime	Prolong products lifetime through maintenance	Prolong products lifetime through repair	Prolong products lifetime through design for durability	Optimise	Increase performance/efficiency of products	Customisation/made to order	Reproductible and adaptable manufacturing	Minimize waste in production and supply chain	Increase efficiency of production processes	Loop	Remanufacture products and/or components	Implement take-back programs	Recycle materials	Promote the cascade use of wood	Promote extraction of biochemicals from organic waste
A	Conveying goods, material, equipment and other items to work areas, and removing finished pieces.															●	●	●	●		●	●				
B	Verifying specifications of goods, material, equipment and other items and checking the quality in order to ensure adherence to specifications.			●										●	●	●	●	●		●	●	●	●		
C	Loading and unloading vehicles, trucks and trolleys.														●	●		●							
D	Clearing machine blockages, and cleaning machinery, equipment and tools.														●	●	●	●							
E	Carrying out manual sorting of products or components.														●	●		●		●	●	●			
F	Recording operational data on specified forms.			●										●	●	●	●	●				●	●		
G				●				●						●		●	●				●	●	●	●	

*McKinsey center and Ellen MacArthur Foundation

Tasks changes

Current and forecasted tasks changes due to sector circular economy transition (in green for 2030) and digitalization (in blue for 2025) for the occupational profile: Factory hand - ISCO 9329

2025/30

Occupational profile

Description forecast of the occupational profile in 2030

Factory hands assist machine operators and product assemblers. They clean the machines and the working areas. Factory hands make sure supplies and materials are replenished.

- Works in accordance with basic health and safety regulations, including environmental protection and efficient energy use.
- Works in a customer-oriented manner.
- Considers cost, environmental impact and time-effectiveness when planning and organizing his/her work in his/her area of influence.
- Contributes to continuous improvement of work processes in the company.
- Coordinates work with the rest of the team, report to his/her team leader.
- Cooperates with other departments (administrative, commercial, ICT and technical services).
- Assists in the implementation of quality assurance and sustainability activities.
- Assists in the reduction of the environmental impact of the manufacturing, repair, remanufacturing or recycling processes (e.g. waste generation or energy use reduction, etc.).

	Virtualise	Virtualise direct aspects of the product	Virtualise indirect aspects of the product	**Exchange**	Replace old materials with advanced renewable ones	Apply new technologies	Choose new products and services	**Profile tasks forecast**
A			●			●		Conveying goods, material, equipment and other items to highly digitized, connected and automated work areas, and removing finished pieces, applying sustainable working practices (e.g. waste management, etc.).
B			●		●	●		Digitally verifying technical & environmental specifications of goods, material, equipment and other items and checking the quality in order to ensure adherence to these specifications.
C			●			●		Loading and unloading vehicles, trucks and trolleys in a digital and ecoefficient manufacturing plant, reducing the impact of logistics (e.g. load optimisation, etc.).
D			●			●	●	Clearing machine blockages, and cleaning machinery, equipment and tools when predictive maintenance and online realtime monitoring could not prevent this; using non-hazardous substances, reducing their consumption and making a proper management of the generated waste.
E			●			●		Carrying out semi-automated sorting of products or components when necessary in highly digitized and ecoefficient factory.
F			●		●	●		Recording operational data of the digital and ecoefficient factory on specified forms, including environmental performance indicators.
G					●			Following disassembly instructions and using adequate tools for destructive disassembling of out of use or defective wood-based products for separation of materials and elements to future recovery or recycling.

Factory hand
ISCO 9329

2020
Occupational profile

Current profile description
Factory hands assist machine operators and product assemblers. They clean the machines and the working areas. Factory hands make sure supplies and materials are replenished.

- Works in accordance with basic health and safety regulations, including environmental protection and efficient energy use.
- Works in a customer-oriented manner.
- Considers cost- and time-effectiveness when planning and organizing his/her work in his/her area of influence.
- Contributes to continuous improvement of work processes in the company.
- Coordinates work with the rest of the team, report to his/her team leader.
- Cooperates with other departments (administrative, commercial and technical services).
- Assists in the implementation of quality assurance activities.

New categorization of hazards

Current profiles tasks		**Mechanical hazards**	Unprotected moving parts[1]	Parts with hazardous shapes (cutting, pointed, rough)	Moving means of transport and tools[2]	Uncontrolled moving parts (flying objects, wood chips)	Slip and trips	Falls from height	**Ergonomic hazards**	Heavy loads/heavy dynamic work	Awkward position/unbalanced strain	Repetitive movements	Lack of exercise, inactivity	**Electrical hazards**	Electric shock	**Hazards due to physical effects/physical agents**	Noise	Vibration	Laserlight	**Fire and explosion hazards**	Flammable substances	**Work environment hazards**	Poor lighting conditions	Climate	Poor ventilation	**Hazards through dangerous substances**	Dust	Solvents (neurotoxic, allergens)	Carcinogens	New materials (e.g. Nanomaterials)	Recycled material	**Biological Hazards**	Non-targeted activities with microorganism	**Psychosocial hazards**	Excessive workloads	Low job satisfaction	Work tasks not clearly defined
A	Conveying goods, material, equipment and other items to work areas, and removing finished pieces.		●	●	●		●			●●	●●	●			●		●●	●●					●	●	●		●			●	●				●	●	●
B	Verifying specifications of goods, material, equipment and other items and checking the quality in order to ensure adherence to specifications.		●		●		●			●●	●●	●					●●						●	●	●		●			●	●				●		●
C	Loading and unloading vehicles, trucks and trolleys.		●	●	●		●			●●	●●	●					●●	●●					●	●	●		●			●	●				●	●	●
D	Clearing machine blockages, and cleaning machinery, equipment and tools.		●	●	●		●			●●	●	●			●		●●	●●			●		●	●	●		●	●	●	●	●				●	●	●
E	Carrying out manual sorting of products or components.		●	●			●			●●	●●	●	●				●●						●	●	●		●			●	●				●	●	●
F	Recording operational data on specified forms.																●●						●	●											●	●	●
G			●	●	●	●	●			●	●	●			●		●	●					●	●	●		●	●	●	●	●		●	●	●	●	●

● No changes ● Reduced due to Circular Economy ● New or increased due to Circular Economy ● Reduced due to digitalization ● New or increased due to digitalization

Hazards and risks changes

Current and forecasted tasks changes due to sector circular economy transition (in green for 2030) and digitalization (in blue for 2025) for the occupational profile: Factory hand - ISCO 9329

2025/30
Occupational profile

Description forecast of the occupational profile in 2030

Factory hands assist machine operators and product assemblers. They clean the machines and the working areas. Factory hands make sure supplies and materials are replenished.

- Works in accordance with basic health and safety regulations, including environmental protection and efficient energy use.
- Works in a customer-oriented manner.
- Considers cost, environmental impact and time-effectiveness when planning and organizing his/her work in his/her area of influence.
- Contributes to continuous improvement of work processes in the company.
- Coordinates work with the rest of the team, report to his/her team leader.
- Cooperates with other departments (administrative, commercial, ICT and technical services).
- Assists in the implementation of quality assurance and sustainability activities.
- Assists in the reduction of the environmental impact of the manufacturing, repair, remanufacturing or recycling processes (e.g. waste generation or energy use reduction, etc.).

	Poor organisation of work	Poorly designed workplace environment (incl. software)	Repetitive, monotonous work	Cognitive strain	Stress due to long period concentration and awareness	Increased demands on flexibility	Lack of work experience	Lack of involvement in making decisions that affect the worker	Ineffective communication, lack of support from management or colleagues	Working alone/isolation	Workload: overload/underload	**Profile tasks forecast**
A	●	●	●			●	●	●	●		●	Conveying goods, material, equipment and other items to highly digitized, connected and automated work areas, and removing finished pieces, applying sustainable working practices (e.g. waste management, etc.).
B	●	●		●		●	●		●	●	●	Digitally verifying technical & environmental specifications of goods, material, equipment and other items and checking the quality in order to ensure adherence to these specifications.
C	●	●	●			●	●	●	●		●	Loading and unloading vehicles, trucks and trolleys in a digital and ecoefficient manufacturing plant, reducing the impact of logistics (e.g. load optimisation, etc.).
D	●	●				●	●	●	●		●	Clearing machine blockages, and cleaning machinery, equipment and tools when predictive maintenance and online realtime monitoring could not prevent this; using non-hazardous substances, reducing their consumption and making a proper management of the generated waste.
E	●	●	●		●	●	●	●	●	●	●	Carrying out semi-automated sorting of products or components when necessary in highly digitized and ecoefficient factory.
F	●	●			●	●	●		●	●	●	Recording operational data of the digital and ecoefficient factory on specified forms, including environmental performance indicators.
G	●	●	●	●		●	●					Following disassembly instructions and using adequate tools for destructive disassembling of out of use or defective wood-based products for separation of materials and elements to future recovery or recycling.

1 Cobotics (Squeezing, bumping, crushing, cutting, amputation, drawing-in/trapping).
2 Run over, roll over, falls from height.

КЪМ ИНДЕКС

Hazards and risks changes

Current and forecasted risks changes due to sector circular economy transition (in green for 2030) and digitalization (in blue for 2025) for the occupational profile: Factory hand – ISCO 9329

2020 Current situation	2025-30 Situation forecast
Work system/work area: working on site, cleaning and tidying up the workshop and machines, passing tools and materials, storage activities, supporting machine operators.	Work system/work area: working on site, cleaning and tidying up the workshop and machines, passing tools and materials, storage activities, supporting machine operators, loading and unloading activities, using digitalized instruments, collecting and sorting generates waste following sustainable and ecological requirements, using less hazardous materials , support in disassembling, repair and dismantling of furniture.
Mechanical hazards	
• Mechanical hazards from moving machines and tools and means of transportation, uncontrolled moving parts and parts with dangerous shapes.	• Mechanical hazards from moving machines and tools and means of transportation, uncontrolled moving parts and parts with dangerous shapes. Hazards from moving cobots/robots. Some risks from mechanical hazards may decrease, depending on takeover of specific tasks by cobots/ robots. Most of industrial cobots and robots are unaware of their surroundings therefore they can be dangerous to workers. Industrial robots can pose several types of hazards based on their origin: Mechanical hazards such as those arising from unintended and unexpected movements or release of tools. Support in remanufacturing and selective disassembling of furniture could require new type of tools not available. Better design of products (ecodesign) could reduce hazards associated to assembly/ disassembly operations, using optimised joining systems, etc.
Effects: severe bruises, amputations, cuts and sharp injuries, crushing, roll over or being crushed by means of transportation, forklift trucks etc.	**Effects**: severe bruises, amputations, cuts and sharp injuries, crushing, roll over or being crushed by means of transportation, forklift trucks etc.
• Slips and trips, obstacles, table edges, moving vehicles, machines.	• Slips and trips, obstacles, table edges, moving vehicles, machines.
Effects: squeezing, cutting, twisting, spraining, bumps and bruises.	**Effects**: squeezing, cutting, twisting, spraining, bumps and bruises.
Ergonomic hazards	
• Ergonomic hazards: from poor ergonomic conditions, awkward position, confined spaces, handling heavy loads.	• Ergonomic hazards: from poor ergonomic conditions, awkward position, confined spaces, handling heavy loads. Risks from ergonomic hazards may decrease, depending on take over of specific tasks by cobots/ robots. On the other hand, workers are increasingly exposed to ergonomic hazards such as lack of exercise/inactivity because of operating autonomous machines and cobots from computer workstations as well as repetitive movements due to operating digitized machinery. Support in remanufacturing and repair services as well as dismantling of manufactured goods may be related to Musculoskeletal Disorders (MSDs) (e.g. awkward positions, heavy lifting and carrying). The risk of heavy loads may be reduced for factory hands due to use of lighter materials. Exposure to awkward positions may be reduced for workers if occupational safety and health is taken into account from the beginning, when the machinery is designed.
Effect: musculoskeletal diseases.	**Effect**: musculoskeletal diseases.
Electrical hazards	
• Electrical hazards: caused by contact with defective or unearthed electrical equipment.	• Electrical hazards: caused by contact with defective or unearthed electrical equipment. Electrical hazards from woodworking machines and from autonomous or highly autonomous equipment.
Effect: fatal accident.	**Effect**: fatal accident.
Hazards due to physical effects/physical agents	
• Noise: sawmill, other wood processing machines.	• Noise: sawmill, other wood processing machines. Exposure to noise and vibration may decrease, depending on takeover of specific tasks by cobots/robots. Noise maybe reduced due to ecodesign of machinery operating quieter and more environmental-friendly. However, noise during support of repair, dismantling or remanufacturing furniture may still be a risk.
Effects: hearing loss, headache, nervousness, poor concentration.	**Effects**: hearing loss, headache, nervousness, poor concentration.
• Vibrations	• Vibrations: exposure to vibration may decrease, depending on takeover of specific tasks by cobots/robots. Vibration maybe reduced due to ecodesign of machinery operating with less vibration energy and more environmental-friendly. However, vibrations during support of repair, dismantling or remanufacturing furniture may still be a risk.
Effect: hand-arm-vibration syndrome (e.g. white finger disease).	**Effect**: hand-arm-vibration syndrome (e.g. white finger disease).

2020 Current situation	2025-30 Situation forecast
Fire and explosion hazards	
• Fire and explosion hazards from materials, including wood dust and chemicals.	• Fire and explosion from materials, including wood dust and chemicals. Exposure to fire and explosion hazards may decrease, depending on takeover of specific tasks by cobots/robots. Dust maybe emitted during support of dismantling activities – inappropriate dust extraction system increases risk of dust explosion. Fire hazards of solvents when cleaning machinery, equipment and tools may be reduced due to new cleaning products based on less flammable substances such as water.
Effect: burns, fatal accidents.	**Effect**: burns, fatal accidents.
Work environmental hazards	
• Work environmental hazards: excessive heat and cold, poor lighting.	• Work environmental hazards: excessive heat and cold, poor lighting.
Effects: cardiovascular diseases, negative effects on muscles, tendons and joints, cold, poor concentration, eye strain.	**Effects**: cardiovascular diseases, negative effects on muscles, tendons and joints, cold, poor concentration, eye strain.
Hazards through dangerous substances	
• Chemical hazards/dangerous substances: asbestos, glass fibre, vapours, fumes, dust, solvents.	• Chemical hazards/dangerous substances: asbestos, glass fibre, vapours, fumes, dust, solvents. The risk of being exposed to chemicals may decrease, depending on takeover of specific tasks by cobots/robots Maybe reduced, due to products/materials used for cleaning machinery, equipment and tools based on less dangerous substances.
Effects: contamination/intoxication, skin diseases, respiratory diseases, cancer.	**Effects**: contamination/intoxication, skin diseases, respiratory diseases, cancer.
	• New materials (e.g. nanomaterials): ranotechnology and nanomaterials may be used in woods as well as wood-composite materials in order to improve some of their properties, e.g. to improve the water resistance or thermal conductivity. **Effects**: not yet well known, included are among others inflammation and tissue damage, fibrosis and tumour generation.
	• Recycled material: risk of exposure to dangerous substances may be increased through lack of information on chemicals contained in recycled products and on ways how to deal with them appropriately. Recycled material may contain dangerous substances, to the latest findings carcinogen or repro-toxic. (nowadays restricted by law (REACH)). **Effects**: contamination/intoxication, skin diseases, respiratory diseases, cancer.
Biological hazards	
• Biological hazards: bacteria, mould and fungi.	• Non-targeted activities with microorganism: support of selective and/or destructive disassembling for separation of materials and elements for further recovery or recycling may expose workers to microorganism such as mould (recycled, old and used material may contain mould).
Effects: contamination/intoxication, skin diseases, respiratory diseases, infections.	**Effects**: contamination/intoxication, skin diseases, respiratory diseases, infections.
Psychosocial hazards	
• Organisation of work: time pressure, shift work, stress, often related to poor work organisation, lack of experience and training, overload, low job satisfaction, repetitive, monotonous work.	• Organisation of work: time pressure, shift work, stress, often related to poor work organisation, lack of experience and training, overload, low job satisfaction, repetitive, monotonous work, interactions between a robot and a human worker can lead to mental health risks.
	• Lack of experience: new software and digital devices require training, some workers may not have enough competences and may feel overloaded, not experienced enough. Increased demand on competences and up-to-date knowledge on the current development in circular economy and recycling industry: Repair, remanufacture and selective disassembly require new methods and procedures.
• Social relationship: Lack of involvement in making decisions that affect the worker.	• Social relationship: Lack of involvement in making decisions that affect the worker. Cobots/robots that replace colleagues may increase the risk of working alone and feeling isolated.
• Working method: unskilled work, working with colleagues.	• Working method: unskilled work will change to digital know how. Long period of concentration working with computer and new software and performing multitasking. Increased demand on flexibility as workers may perform some tasks from everywhere with mobile devices. Workers are also at risk of being permanent available outside working hours. Robots/cobots may take over many tasks originally intended for factory hands, this may increase the feeling of being useless. On the other hand, operating more and more digitalized tools may change the task for factory hand totally and require new training and competences.
Effects: stress, burnout.	**Effects**: stress, burnout.

Skills and competences needs

Forecast of training new needs due to sector circular economy transition (in green for 2030) and digitalization (in blue for 2025) for the occupational profile: Factory hand – ISCO 9329

Skills, knowledge and competences	Will it continue to be needed?	Main causes/reasons of change: Customisation/made to order	Reproductible and adaptable manufacturing	Increase efficiency of production processes	Apply new technologies	Working in highly digitized, connected and automated work areas	Step in situations where machines and automated processes block or temporarily fail
Essential skills and competences							
Clean building floors	NO						
Clean equipment	YES, changed				●	●	●
Clean surfaces	YES, changed				●		
Maintain work area cleanliness	YES, changed					●	●
Supply machine	YES, changed	●	●	●		●	●
Supply machine with appropriate tools	YES, changed					●	
Wear appropriate protective gear	YES						
Disassemble wood-based furniture products	NEW		●		●	●	●
Examine disassembled pieces for further steps (reuse, recylce, upcycle)	NEW		●	●	●	●	●
Essential knowledge							
Cleaning products	YES, changed			●	●		
Cleaning techniques	YES, changed			●	●	●	
Industrial tools	YES, changed					●	●
Generic green skills, knowledge and competences (*)							
Environmental awareness and willingness to learn	NEW		●	●	●		
Systems and risk analysis skills	NA						
Innovation skills	NA						
Coordination, management and business skills	NA						
Communication and negotiation skills	NA						
Marketing skills	NA						
Strategic and leadership skills	NA						
Consulting skills	NA						
Networking, information technology and language skills	NA						
Adaptability and transferability skills	NEW		●	●	●		
Entrepreneurial skills	NA						
Waste, energy and water quantification and monitoring	NA						
Material use and impact quantification and monitoring	NA						
Material use and impact minimisation	NEW		●		●		

(*) Source: Strietskallina et al. and Dr. Margarita Pavlova

Финландия
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Картографиране на инициативите за кръгова икономика в ЕС

В рамките последните няколко години в европейските градове, региони и държави се развиват стратегии за кръгова икономика. След 2014 г., са приети 33 стратегии и поне още 29 са в процес на разработка.

Ние сме издали специфичен доклад „Колекция на релевантните инициативи, подкрепящи кръговата икономика в ЕС“, който не претендира да е изчерпателен списък, но съдържа примери на различни подходи за насърчаване на кръговата икономика в няколко държави-членки на ЕС. Повечето от тях са фокусирани върху ефективността на ресурсите и понижение на отпадъците, но някои инициативи се занимават и с теми като устойчиво развитие или климатични промени. Можете да намерите пълния доклад тук: bit.ly/2KqAu8l

линковете върху тази карта ви позволяват достъп до специфични доклади, създадени от EIONET, съдържащи обзор от политики, подходи и цели на 32 европейски държави, свързани с ефективност на ресурсите и кръгова икономика и тяхното ниво на развитие.

Други източници на информация, използвани за доклада, свързан с инициативите, стратегиите и анализите, свързани с кръговата икономика, са:

- Стратегии и пътни карти за кръгова икономика в Европа: Идентифициране на синергии и потенциал за сътрудничество и изграждане на съюзи - проучване от Европейския икономически и социален комитет: bit.ly/2NchxqZ
- Европейска платформа за заинтересованите страни в кръговата икономика: bit.ly/3bRv8hM

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КЪМ ИНДЕКС

Заключения

Производителите на мебели, приемащи кръговостта и кръговите практики ще стават все повече и повече, тъй като кръговата икономика е ключът за справяне с климатичните предизвикателства и с предизвикателствата пред околната среда и с изискванията за принос от сектора, които непрекъснато ще се повишават. Кръговостта е в начална фаза и резултатите ще станат видими в средно- до дългосрочен план.

Две скорошни инициативи на ЕС ще улеснят този преход към кръгова икономика. От една страна, Европейският зелен пакт (COM(2019) 640 финален), който ще подкрепи и улесни прехода към устойчиво модел на инклузивен растеж на промишлеността на ЕС, и от друга страна, новият План за действие за кръгова икономика (COM(2020) 98 финален), в който мебелният сектор е специално споменат като една от приоритетните групи с продукти в контекста на веригите на стойност, описани в Плана.

Заявлението на визията на проекта SAWYER до 2030 г. е следното:

До 2030 г., с широко ***цифровизиран мебелен сектор****, базираната на дървообработка мебелна промишленост ще предлага* ***продукти и услуги*** *с* ***дизайн, вземащ предвид околната среда,*** *базиран на* ***сурови материали с ниско въздействие и с възможност за проследяване, устойчиви производствени процеси****, и насърчаване на* ***най-добрите варианти за използване и възстановяване*** *на материали и отпадни продукти. Клиентите (B2B или B2C) ще изискват по-подробна информация за продуктите и техните****устойчиви характеристики****, включително индикатори на полезен живот и овластяването на клиента ще бъде ключът за успеха на целите за кръговост. Властите (на местно, национално и европейско ниво) ще улеснява кръговостта* ***чрез насърчаване на устойчиви варианти*** *за употреба на отпадни продукти за материали и дървени продукти, като ще разширяват* ***зелените обществени и частни програми за закупуване*** *и ще насърчават* ***политиките за ефективност на материалите****.*

В анализа, направен от SAWYER, специфични фактори/действия показват по-високо ниво на въздействие върху повечето от оценените професионални профили, като:

- Преминаване към възобновяеми материали;
- Повторна употреба на продукти през техния технически жизнен цикъл;
- Удължаване на жизнения цикъл на продуктите чрез поддръжка и ремонт;
- Удължаване на живота на продуктите чрез тяхното проектиране за дълготрайност;
- Повишение на характеристиките за представяне/ефективност на продуктите;
- Повишение на ефективността на производствените процеси;
- Преработка на продукти и/или компоненти;
- Рециклиране на материали;
- Насърчаване на каскадното използване на дървесина;
- Виртуализиране на косвените аспекти на продукта;
- Замяна на стари материали с нови, възстановими такива
- Прилагане на нови технологии.

За да се справят с предизвикателствата, поставени от прехода към кръговост и да се възползват от предлаганите от него възможности, заинтересованите страни в мебелния сектор на ЕС ще трябва да разглеждат този преход като част от **двойния преход** (зелен и цифров) на сектора, тъй като те са тясно свързани. Както е прогнозирано от резултатите на проекта DIGIT-FUR, промишлеността, произвеждаща мебели от дърво ще предлага персонализирани смарт продукти и услуги, базирани на цифрови производствени системи, предлагани от ресурсно-ефективни и устойчиви индустрии. Голям брой различни технологии (напр. евтини съвременни датчици, IoT/IIoT, интернет от следващо поколение, изкуствен интелект, VR/AR, допълващи роботи и др. ...) ще предлагат трансформиращ бизнес потенциал, както от гледна точка на продукти, които могат да бъдат разработени и произведени, така и за самия производствен процес, за тези, които могат да ги използват. Друго значително предизвикателство за индустрията на мебели от дърво ще бъде осигуряването на работниците на необходимите умения за ефективно справяне с тази цифрова трансформация. Като цяло, технологиите на Индустрия 4.0, ще окажат значително въздействие върху производствените процеси в сектора през следващите години и ще подпомогнат прехода на сектора към по-кръгова икономика.

Разглеждайки това от обща перспектива, двойният преход на сектора трябва да представлява референтна рамка за всички бъдещи анализи на сектора, иновация на компаниите за продукти и производствени процеси, иновативни бизнес модели, политики в сектора и последващ социален диалог в сектора.

От гледна точка на цифровизацията, мебелната промишленост се преобразува бързо от традиционна промишленост в компютъризиран промишлен отрасъл. Въз основа на очакваните промени в анализираните професионални профили, като се използват лостовете на McKinsey и като се вземат предвид технологиите Industry 4.0 – DIGIT-FUR прогнозира **промените в търсенето на умения, познания и способности**. Бъдещите служители в мебелната промишленост трябва не само да могат да изпълняват ефективно задачи, но и да притежават умения и способности да признават и приемат непрекъснати промени. Необходимото ниво на квалификация ще стане по-високо и по-специализирано, тъй като същността на уменията става по-абстрактна поради дигитализацията/компютъризация.

Няма увеличена нужда от професионални умения, но професионалните или техническите умения изискват пълна интеграция на (всички уместни) дигитални умения. Техническите познания остават важни и формират основата; познавателните, социалните и поведенческите умения ще станат приоритет. Хората вече няма да се избират на базата на своята диплома, а в зависимост от начина им на мислене. Всеки индивид ще бъде отговорен за собствената си настойчивост в обучението и самоусъвършенстването.

За някои професионални профили ще бъдат необходими **нови зелени умения**, тъй като ще има нови, специфични задачи, свързани с разглобяване и повторна употреба, повторно производство, рециклиране и творческо повторно приложение. Тези нови умения са особено важни за задачите на „практическите“ профили. Ние обръщаме внимание на следните:

- разглобяване на базирани на дърво мебелни продукти
- изследване на разглобените елементи за следващи стъпки (повторна употреба, преработка, рециклиране, творческо повторно използване)
- ремонт на елементи на базирани на дърво мебели, където е необходимо

Тези нови умения ще имат своето влияние, въпреки че то няма да бъде толкова значително, върху профилите, които управляват и вземат стратегически решения в компаниите. Тези умения идват като „допълващи" съществуващите необходими умения за изследваните профили.

В допълнение, **генеричните зелени умения, познания и компетенции** са дефинирани като необходими за социалното, икономическото и екологично развитие в рамките на сектора на мебелите от дървесина. Тези генерични зелени умения са подравнени с ключови компетенции или меки умения, които са контекстуализирани в рамките на перспективата на екологичната осведоменост и разбирането на устойчивото развитие и кръговата икономика.

Двойният преход в мебелния бранш поставя **нови предизвикателства за здравето и безопасността на работното място.** Мебелната промишленост може да бъде **наистина устойчива** (екологично, социално и икономически) само след като гарантира безопасността, здравето и благосъстоянието на своя **най-важен ресурс: своите работници** – или най-малкото, тя не може да бъде устойчива без да защити по най-ефективен начин тяхното здраве и безопасност.

Новите типове работни места, новите процеси, новите технологии и **новите материали/продукти** могат да въздействат върху здравето и безопасността на работниците, но ако бъдат планирани и въведени правилно, **здравето и безопасността на работниците със сигурност ще се подобрят**. От гледна точка на цифровизацията, роботите и цифровите технологии могат да направят работата, която изисква физическо натоварване или е монотонна, по-лесна, по-ефективна и по-безопасна. Работниците могат да бъдат изведени от опасни среди и датчици могат да дават автоматична индикация за това дали машината се нуждае от техническо обслужване и по този начин да бъде намален рискът от възникване на неизправности на машините и на инциденти. Типичните опасности в мебелната промишленост, като опасни вещества, прах, опасни машини и инструменти, ще продължат да съществуват, но опасността от излагане на тези рискове ще намалее.

Анализът показва, че преходът към по-кръгова икономика ще **подобри глобалната околна среда**, но в никакъв случай този преход не трябва да понижи здравето и безопасността на работниците. Поради тази причина, ние, заинтересованите страни в мебелния сектор, трябва да гарантираме, че този преход и неговите нови технологии или работни процеси не водят до нови рискове. И ние трябва да гарантираме, че новите и рециклираните материали не могат да изложат работниците на риск от „нови" или скрити опасни вещества**. Кръговата икономика в сектора**, обръщаща еднакво внимание на здравето и безопасността на работното място и на екологичните проблеми, трябва да се **въведе чрез по-безопасни и ефективни машини, работни процеси и материали**, които могат да контролират химическите и физически рискове за работниците. Прилагането на концепциите за **екологичен дизайн**към продуктите трябва да възстанови дейностите по възстановяване и ремонт, да понижи ергономичните рискове и трябва да понижи съдържанието на опасни вещества, като по този начин ще понижи химическите рискове в цялата верига на стойност. Здравето и безопасността на работниците трябва да се повиши чрез интегрирането на управление на здравето и безопасността на работното място в системите за управление на качеството на компаниите.

Двойният преход на мебелния сектор, ако не бъде ръководен и въведен правилно, може да доведе до нови предизвикателства и стрес за работниците. Повишаването на работното натоварване и сложността на задачите, удълженото работно време и постоянната достъпност предизвикват напрежение и проблеми на работното място, което води до психо-социални рискове (EUOSHA, 2015). За да бъдат избегнати тези нови рискове, **придобиването на нови знания, способности и гъвкавост** за правилното справяне с повишаващото се ниво на автоматизация, нови процеси и разработването на нови продукти е реална и ключова необходимост за всички работници в сектора.

Резултатите от тези анализи на проекта SAWYER могат да се използват за:

- правилното разбиране на това как работата и безопасността на работниците в сектора ще се променят поради въздействието от прехода към кръгова икономика;
- подготовка на компаниите и работниците за справяне и използване на предстоящите предизвикателства и възможности; и
- създаването на по-стабилна основа за бъдещите дискусии и сътрудничества в Европейския социален диалог.

Освен това, тези комбинирани анализи на цифровизация и кръговост, двойният преход, показаха съответни синергии между тях. Например свързани с:

- как екологичната информация за продуктите (напр. съдържание на опаси вещества, части, които могат да се използват отново, рециклируеми материали и др. ...) трябва да бъдат събирани и предавани по веригата за доставки, до достигане на клиент или рециклиращо предприятие;
- как да се премине от продукти към услуги (виртуализация, дематериализация, сервитизация и др. ...);
- как да се намали въздействието върху околната среда от производствените процеси чрез използването на нови технологии (напр. енергийна ефективност, понижение на отпадъци, оптимизация на сурови материали и др.).

Този синергичен анализ подкрепя визията, че в бъдеще мебелният сектор на ЕС ще бъде значително повлиян от двойния преход и че заинтересованите страни ще трябва внимателно да се справят с цифровите и кръговите предизвикателства, за да могат да използват по най-добрия начин всички възможности, предоставяни от тях.

Препоръки

Пътят към кръгова икономика **изисква сътрудничеството на различни участници**, от създадели на политики, до промишленост, експерти, научна общност и клиенти. За активиране и ускоряване на прехода към по-кръгова икономика, **предлагането от страна на индустрията на по-кръгови продукти** трябва да се разшири заедно с търсенето на такива продукти от страна на **пазара и потребителите**. За да се постигне това, **доставчиците на професионално образование и обучение и създаващите политики играят ключова роля** при насърчаването на тези две ключови тенденции и поради тази причина, в следващите части на настоящия документ, ще намерите различни специфични препоръки за създателите на политики и за ПТО системата, които ще им помогнат при постигането на тези цели.

Въпреки горното и факта, че някои от следващите препоръки са фокусирани върху справянето с предизвикателствата, поставени от прехода на сектора към по-кръгов мебелен сектор, е важно винаги да се помни, че на практическо ниво, секторът ще бъде засегнат едновременно и съвместно от своя двоен преход (цифров и зелен). Това е необходимо не само да позволи на заинтересованите страни в сектора да се справят с предизвикателствата в сектора, но най-вече да им позволи успешно да се възползват от възможностите, предлагани от това специфично и съвместно въздействие.

Създатели на политики

Гарантирането на успеха на прехода към по-кръгова икономика в рамките на сектора, двойният преход изисква **налагането на хармонизирани правила на ЕС/международно ниво** и въвеждането на инициативите на ЕС **по последователен начин от държавите-членки**, понижавайки опасността от фрагментиране на вътрешния пазар и **избягване на бариерите** пред свободното движение на (по-) устойчиви и кръгови стоки.

За да се гарантира плавно въвеждане на инициативите на ЕС, са необходими **семпли и интелигентни правила и ясни дефиниции, свързани с кръговата икономика** на ниво ЕС, както и **общ език**, особено когато става въпрос за параметри, измерващи кръговостта, като „дълъг живот", „повторно използване", „рециклируемост" и др. Това е ключът за **предоставяне на хармонизирана информация на потребителите**. Инициативата за политика за устойчиви продукти на ЕС трябва да предостави яснота и правила по тези въпроси. Един от нейните основни елементи е разширяването на обхвата на директивата за екологичен дизайн, така че в нея да бъдат включени продукти, които не са свързани с енергия, като мебели. Широката гама от продукти, които се разглеждат като „мебели" и разнообразието на използвани материали при тяхното производство **прави това сложен сектор**. Критериите за екологичен/кръгов дизайн няма да са приложими за всички продукти по един и същи начин. В този контекст ще бъде важно да се вземе предвид сложността на мебелите, необходимостта от подход, тип **стъпка по стъпка** за **хармонизиране** на европейско **законодателно ниво** и **между различни политики** и трябва да бъде организиран **диалог** с индустрията. (bit.ly/3a0Gihs)

Когато стане въпрос за пречки пред кръговия дизайн, **ключовите аспекти, с които трябва да се справи, са** наличието на **заместващи материали и части**, както и **липсата на информация от доставчици** по отношение на бъдещи притеснение вещества и строгите национални регламенти, водещи до използването на нежелани химикали (какъвто е случаят с токсичните забавители на горенето, които често са необходими за изпълнение на изискванията за запалимост). В тази рамка, Химическата стратегия за устойчивост и устойчиви продукти на ЕС трябва да насърчи **понижението на бъдещи притеснение вещества** в мебелните продукти, като се понижи и излагането на работници на химикали. Както е документирано от Alliance for Flame Retardant Free Furniture (safefurniture.eu), забавителите на горене мигрират от продуктите и се натрупват в околната среда и тяхната употреба противоречи на целите на кръговата икономика. Тези химикали нямат доказани ползи при защита от пожар и има множество доказателства за тяхното вредно въздействие върху **здравето на хората и работниците**, повишена **токсичност при пожар** и околната среда (bit.ly/2Y6beHN // bit.ly/2KLXjni). Те представляват **риск, който може да бъде избегнат** за работниците по време на производство, продажба и обработка. Това е обичаен риск за тапицерите и се очаква тяхното приложение се да се **понижи или изчезне** при **прехода** на сектора към по-кръгова икономика и ако предстоящите политически инструменти се занимаят с ненужната **употреба на токсични забавители на горенето** в мебелите.

Като част от двойния преход на сектора, преходът на сектора към кръгова икономика ще зависи и от други параметри, като **повишена цифровизация, иновативни инструменти** и **непрекъснати усилия за иновация и проучвания**. Тези услуги и инвестиции по отношение на кръговостта и разработването на по-екологични технологии трябва да бъдат подкрепяни от **програми за финансиране**, като Horizon Europe и др. Подходящите инвестиции трябва да улеснят този преход и да се гарантира, че те достигат до всички участници, най-вече до МСП и да насърчават сътрудничеството между компании и заинтересовани страни. Новата Индустриална стратегия на ЕС трябва да насърчава и улеснява двойния преход, като едновременно разглежда възможностите на цифровизацията и кръговостта на индустрията.

Политическите инициативи, като Европейския зелен пакт или Планът за действие за кръгова икономика, трябва да **стимулират пазарното търсене и предлагане на кръгови продукти**, да насърчават **развитието на нови бизнес модели**, например, продукт като услуга, да насърчават повторната употреба, ремонта, преработката, рециклирането, модела за отказ от собственост, модели, позволяващи грижа, ремонт и реставриране, презакупуване или B2B закупуване.

Поради огромното въздействие на пандемията от COVID19, усилията на институциите и държавите-членки на ЕС трябва да бъдат насочени към възстановяване от социалната и икономическа криза, използвайки стимулиращи пакети (напр. ЕС от следващо поколение, Инструмент за възстановяване и устойчивост и Европейски социален фонд Плюс) също за борба с климатичните промени, за насърчаване на цифорвизацията и кръговата икономика и за **улесняване на обучението на работниците за нови технологии и зелени умения**, най-вече по отношение на работниците с ниска квалификация, жени, мигранти, младежи, както и възрастни работници.

Професионално техническо обучение (ПТО)

Образованието е силата на бъдещето, защото то е един от най-мощните инструменти на промяната. Един от най-големите проблеми, с които се сблъскваме, е как да коригираме начина си на мислене, така че да се справим с предизвикателствата на постоянно усложняващия се свят. Трябва да преобмислим начина си на организиране на знанието. Това означава сриване на традиционните бариери между дисциплините. Трябва да **преработим нашите образователни политики и програми**. И когато тези реформи влязат в сила, трябва да **погледнем дългосрочно** и да оценим огромната си отговорност към бъдещите поколения.

Двойният преход на мебелната индустрия поставя **изисквания за нови специфични способности и умения** за работната сила. Прогнозирането и изграждането на умения за бъдещето са от съществено значение за бързо променящия и озеленяващ се пазар на труда. Това се отнася за всички промени във видовете и равнищата на необходимите умения, така също в професионалните и техническите области.

Настоящето предлагане на умения често не съответства на това търсене на нови и адаптирани умения. Съществува **явна пропаст сред търсените умения** от двойния преход на мебелния сектор **и предлаганото от образованието в дадения момент**.

UNESCO описва **Пет измерения на озеленяване на TVET (Техническо и професионално образование и обучение)** като превод на **трите измерения на устойчивостта**, на които трябва да се обърне внимание - **екологичен, икономически и социален** - в ключова рамка за разбиране на подхода към образованието за устойчиво развитие.

По отношение на двойния преход ние добавихме и цифровия аспект.

Въз основа на тези пет измерения на TVET, можем да препоръчаме следното:

<u>Зелен и цифров кампус</u>

Управление на кампус по отношение на енергия, вода, управление на отпадъци и замърсяване.

- За училищата и центровете за обучение е почти **невъзможно да се справят с всички инвестиции, изисквани** от двойния преход, тъй като новите технологии се развиват изключително бързо.

Следователно, зеленият и цифров кампус трябва да се фокусира и върху включването на **хибридни учебни среди**, в тяхното официално обучение, предложение за обучение на работно място, дуално обучение, стажове. Зеленият и цифров кампус инвестира в цифрови методи на обучение, в електронно обучение чрез MOOCS (масови открити онлайн курсове), в зелена програма.

Зеленият и цифров кампус е **открит кампус**, където стартиращите компании намират своето място, където компаниите са добре дошли да инвестират като партньори в нови технологии, в зелени проучвания и в нова, гъвкава учебна програма.

<u>Зелена и цифрова учебна програма</u>

Интегриране на образование за устойчиво развитие (ОУР). Зелена технология, чиста технология, зелени работни места и озеленяване на съществуващи работни места. Следователно, съществува необходимост от зелени програми и курсове, зелени практики в класове и семинари и по-добро взаимодействие между индустрията и образователните институции.

Системите за ПТО трябва да бъдат **адаптивни и да се развиват непрекъснато** (по интелигентен начин).

Като вдъхновение, ние даваме следните примери за постигане на зелени(по-зелени) умения.

- Адаптиране на информацията на трудовия пазар по отношение на зелената и цифрова икономика чрез разработка на нова учебна програма и преразглеждане на съществуващата програма и включване на зелени и цифрови аспекти. Това може да се постигне чрез секторни съвети, консултативна организация с ръководители на (зелена) индустрия, цифрови шампиони или консултативни комитети, работещи с местните бизнеси (за регионално приемане, контекст на местния трудов пазар и др.).

- С цел включването на кръговата икономика в програмите на ПТО училищата, бизнесът може да посещава училищата и да говори за начина, по който произвежда продукти. След това представителите на бизнеса могат да дадат свои продукти на учениците, като им поставят задача да променят техния дизайн, от гледна точка на кръговата икономика (circlevet.eu - Steve Parkinson).

- Проектирането и адаптирането или модифицирането на учебната програма може да е в отговор или дори да предвижда променящите се нужди от умения за двойния преход. Проектирането на програми и промяната на курсове и учебни резултати в програмата, които са зададени по **модулен** начин или **са основани на обучение на работното място** улеснява изключително много включването на изискванията за нови умения. Много курсове и програми вече са модифицирани, за да включат (някои) аспекти от кръговата икономика, от устойчивостта и/или цифровизацията. Но доста често това са „странични занимания“ и са изключително ограничени. Например използването на дървесина от устойчиви източници се разглежда единствено по време на теоретични уроци, но не е включено в процеса на закупуване на използвани ресурси от предприятията. Цифровизацията се преподава като концепция, като теория, но често не е включена в практическите занимания с машини, където компютрите са остарели и не са подходящи за взискателните VR/AR приложения.

- Освен адаптирането на учебната програма, ние се нуждаем и от адаптирани обучения за преквалификация и обучение на работното място за „подобряване“ и „промяна“ на уменията на работната сила.

- Непрекъснатото учене (CVET) също е важен елемент за справяне с гореспоменатите препоръки за учебните програми. Описаните по-горе **нови методи на предоставяне** (модулно, на работно място, уеб базирано дистанционно обучение, методи за хибридно обучение, обучение извън кампуса и т.н.) могат да се използват, за да предложат **персонализирани обучения и обучения при поискване** за всеки, който е заинтересован. Важно е методът да се адаптира към специфичната целева група и да се фокусира върху промяна на мисленето, а не върху адресирането на чисто теоретични въпроси.

- Двойният преход трябва да се извърши във всички отдели, да се интегрира във всички клонове и във всички програми и курсове.

Такъв интегриран, устойчив подход, може да се състои от:

- Развиване на умения, необходими за въвеждане на устойчиви и цифровизирани решения;
- Създаване на връзки между избрани

учебни програми и двойния преход;
- Участие във взаимносвързани световни системи;
- Интегрирано разбиране на социални, икономически и екологични системи и дискутиране на практически решения за двойния преход;
- Устойчиво мислене и вземане на решения като подпомагане на процеса за изграждане на решения за социални, екологични и икономически кризи;
- Ангажиране на студентите при научаване „за“, а не само „относно“ двойния преход.

Зелена и цифрова общност

Адаптиране на общността чрез изграждане на капацитет, възобновяема технология и подпомагане не ресурси.

Ефективните методи за прогнозиране на бъдещите нужди от умения включват устойчив диалог между работодателите и служителите, фирмите и обучаващите, координация между правителствените институции, информационните системи за пазара на труда, услугите по заетостта и прегледите на характеристиките на обучаващите институции. Необходимо е сътрудничество през всички етапи (вземащи решения, създатели на политики, практически, организационни и др.). Трябва да участват **всички заинтересовани страни**, организатори на обучение, социални партньори (фирми, организации и асоциации на работодателите и служителите), университети и академичен свят, отраслови организации, обществени служби по труда и всички съответни правителствени партньори (министерства на образованието, труда, околната среда, цифровизацията...). Например за признаване на умения за създаване на **професионални съюзи в отрасъла, също така и междуотраслови**.

Зелени и цифрови проучвания

Насърчаване на проучванията в областите на възобновяемата енергия, зелените иновации и рециклиране на отпадъците.

Във връзка с двойния преход, ние препоръчваме повече съвместни дейности, отнасящи се до **проучването на признаване на умения, изградени извън обичайните учебни среди**. Това признаване, което става все по-важно, трябва да бъде прозрачно и поддържано от всички заинтересовани страни, включително и от институционалните партньори. Само няколко години след завършването на гимназия/университет придобитите знания и умения остаряват в определена степен поради бързо променящата се среда, от гледна точка на двойния преход. Само непрекъснатото ПТО, което може да се предоставя по формален, неформален или неофициален начин, гарантира дългосрочно валидиране на степен/диплома.

Зелена и цифрова култура

Насърчаване на култура на зелени стойности, зелено отношение, зелена етика и зелени практики.

Във връзка с двойния преход, бихме желали да добавим и **цифрова култура** (цифров подход, цифрова етика и цифрови практики).

Освен зелената и цифрова култура, ние препоръчваме и възприемане на **култура на учене в компанията**, която да интегрира неформалното и неофициалното обучение. На работниците трябва да се даде време или да се освободят, за да се обучат правилно и да бъдат полезни за своите компании. Благодарение на гъвкавите и модулни методи на обучение, на място или навън, базирани на работа, навременни, където са необходими (на правилното място и в правилния формат), когато са необходими (в правилното време), работниците могат да се учат по време на професионалния си живот и работни ситуации. Предизвикателството се състои в това **да се гарантира учащите да имат достъп до качествена информация** (вижте „дигитална грамотност“). Трябва да се обърне достатъчно внимание на високообразована работна сила. Тези служители ще отговарят и за обучението на работната сила с по-ниска квалификация. **Очакванията от обучението се повишават**, но се повишават и **възможностите за обучение**.

Зелени умения

Проучванията за бъдещото търсене на умения подкрепят важността на социалните умения, сътрудничеството и способностите в цифровата технология. Дефинираните генерични зелени умения също се включват в тези меки умения.

Необходимите цифрови компетенции и генеричните зелени умения не са толкова различни. Често, контекстът и ситуацията, целта или задачата се разглеждат от различна гледна точка. Следващата таблица представа дефинираните (нови) генерични зелени умения (в ляво) и необходимите цифрови умения (в дясно), както са дефинирани от проекта Digit-Fur. Тъй като цифровите умения са дефинирани по по-общ начин спрямо генеричните зелени умения (които са по-подробни), можем да свържем цифровите умения повече от няколко пъти със зелените умения (в курсив).

Освен тези генерични „меки“ умения, трябва да интегрираме и включим и техническите зелени и/или цифрови умения.

Таблица 9.- Нови зелени умения и връзката им с цифровите умения.

Екологична осъзнатост и желание за учене	Цифрова грамотност
Умения и системи за анализ на риска	Критично мислене и решаване на проблеми
Умения за иновации	Любопитства и иновации
Умения за координация, управление и бизнес	*Инициатива и предприемачество*
Комуникативни умения и умения за преговори	Ефективна комуникация

Маркетингови умения	*Ефективна комуникация*
Стратегически и лидерски умения	*Инициатива и предприемачество*
Консултативни умения	*Ефективна комуникация*
Умения за създаване на мрежи, информационни технологии и езикови умения	Сътрудничество в мрежи
Умения за адаптивност и преноси мост	Гъвкавост и адаптивност
Предприемачески умения	Инициатива и предприемачество
Количествено определяне и наблюдение на отпадъци, енергия и вода	Извличане на информация
Количествено определяне и наблюдение на използване на материали и въздействие в зеленото закупуване и подбор	*Извличане на информация*
Минимализиране на използването и въздействието на материали (оценка на въздействието)	*Извличане на информация*

Формално ПТО

Формалното професионално техническо обучение и образование са по-обширни от единствено ориентираното към пазара на труда и остават важни. Новото повишено **изискване за социални умения трябва да се подкрепя**по най-активен начин. Независимо от важността на тези меки умения, системата не трябва да губи от поглед **базовите технически способности** и необходимостта от актуално техническо образование остава. Човек, който има базови умения, може да бъде креативен в своята работа.

- **По-добро сътрудничество** между образованието и бизнеса, особено за техническите учебни програми. Бъдещите служители в отрасъла трябва не само да могат ефективно да изпълняват задачи, но също се нуждаят **от умения и способности да вземат под внимание предстоящите промени и да се адаптират към тях**. Ролята на умения в множество дисциплини и способности нараства значително и **компаниите ще изискват по-високи и по-специализирани нива на квалификация.**

- Това изместване на способностите също така изтъква **важността на профилите на професионалната квалификация**(създадени от отрасъла), **като основа на начините на обучение** в образованието.

Начално ПТО срещу непрекъснато ПТО

- Има системи с **нарастваща важност на основаните на търсенето, като производствена практика, дуално обучение или базирано на работа обучение.** Тези системи трябва да бъдат внедрени и в двете системи за ПТО.

- Съществуващите **системи за начално професионално техническо обучение (ПТО) и за продължително ПТО** трябва да приемат новите зелени и цифрови технологии. Образователните институции и доставчици на обучения трябва да работят в тясно сътрудничество с компаниите. Не са необходими само технически умения и специализирани познания за двойния преход. Дефинираните генерични меки умения са също толкова важни.

Накрая, можем да заключим, че за наличието на актуална **система за обучение**, ние се нуждаем от **сътрудничеството** на всички заинтересовани страни и партньори за успешното въвеждане и интегриране на новите умения, необходими за двойния преход. Сътрудничество, което изисква вниманието и действията на всички заинтересовани страни да се съсредоточат по допълващ се и съвместен начин.

Необходимо е сътрудничество между **ПТО регулаторни и образователни правителствени органи** за интегриране на новите набори от умения за зелен и цифров свят, вече в начален етап, както е в основното образование и тези умения изискват допълнително развитие по време на средното образование.

Необходимо е сътрудничество между **доставчици на обучения и компании**, за да се предоставят гъвкави и адаптивни обучения, на място или навън, базирани на работа, навременни, където са необходими (на правилното място и в правилния формат), когато са необходими (в правилното време).

Необходимо е сътрудничество между **социалните партньори и асоциации на работниците**, за да се подкрепят и подпомогнат условията, които позволяват на работниците да придобият необходимите опит и умения, за да се справят с двойния преход в сектора. **Персоналът** в сектора ще трябва да възприеме нов начин непрекъснато обучение (учене през целия живот). Той ще трябва да актуализира непрекъснато познанията си за новите рискове в областта на охраната на труда и да действа по съответния начин. Като цяло, всеки човек ще носи отговорност за бъдещите си умения и опит.

Заедно в партньорство с работодатели, правителство и образователни институции, ние може да работим за развиването на търсените умения за двойния преход, да предвидим, изградим и подобрим уменията на всички заинтересовани страни (учители, студенти, родители, работодатели, колеги, администратори и т.н.). По този начин мебелния сектор го чака светло бъдеще.

Тъй като в бъдеще, всяка работа ще бъде зелена и цифрова!

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