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Prognos för sektorn år 2030 från dess cirkulära ekonomiövergång och digital transformation

CENFIM Furnishings Cluster
European Federation of Building and Woodworkers
EFBWW
EFIC European Furniture Industries Confederation
FLA FEDERLEGNOARREDO
UEA

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Av. Generalitat, 66 - 43560
La Senia (Tarragona) SPANIEN
Tel. +34 977 57 01 22
www.cenfim.org

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Denna rapport har utarbetats av CENFIM SAWYER:s tekniska team som består av:
Massimiliano Rumignani
Julio Rodrigo Fuentes
Joaquim Solana Monleón
Med samarbete med följande externa experter:
Juan Carlos Alonso
Jeroen Doom
Ellen Schmitz-Felten

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Ledande partner:

CENFIM Furnishings Cluster

Partners:

European Federation of Building and Woodworkers

EFBWW

EFIC European Furniture Industries Confederation

FLA FEDERLEGNOARREDO

Associerad organisation:

UEA

Samarbetande nationella organisationer:

apmr

BRANCH CHAMBER OF WOODWORKING AND FURNITURE INDUSTRY

CBM

FCBA INSTITUT TECHNOLOGIQUE

FACKET FÖR SKOGS-, TRÄ- OCH GRAFISK BRANSCH

Tack till

Vi vill tacka våra kollegor från SAWYER-partner Chiara Terraneo, Nicolas Sangalli, Omar Degoli, Paolo Chini - FederlegnoArredo, Rolf Gehring - EFBWW, Gabriella Kemendi, Giorgia Murgia - EFIC och från vår associerade organisation David Pavlis - UEA. De gav relevanta insikter och deras expertis inspirerade och hjälpte vår forskning.

Vi är tacksamma till vår EU-kommissionär Danny Scheerlinck för att ha stöttat oss under hela processen.

Vi uppskattar stort de viktiga bidragen från våra externa experter Juan Carlos Alonso (cirkulär ekonomi), Jeroen Doom (yrkesutbildning) och Ellen Schmitz-Felten (arbetsmiljö).

Vi vill tacka alla deltagare i SAWYER-undersökningen och workshopen som med sina olika och tvärvetenskapliga bidrag möjliggjorde en ny bred vision och prognos för möbelbranschen 2030 i förhållande till sektorn för cirkulär ekonomi och dubbelövergången. Utöver de som tidigare nämnts är de: Alessandro Carzaniga, Alex Jimenez, Alexandra Canossa, Andreea Paraschiv, Anton Luiken, Antonella Ilaria Totaro, Arto Rajala, Bouke van den Wildenberg, Brigitte Döth, Carlo Proserpio, Chiara Catgiu, Emilie Bossanne, Erwan Mouazan, Francesc Castells, Francisco J. Campo, Frank O'Connor, Ger Brinks, Jan Leyssens, Jordi Oliver Solà, José María Fernández, Juan José Ortega Gras, Jude Sherry, Justyna Pensiek, Kees Hoogendijk, Kenneth Johansson, Kira Van den Ende, Marcel Van Meesche, Marco Fossi, Marta Escamilla, Marta Schuhmacher, Matthieu Leroy, Melody Van den Acker, Miroslava Simeonova, Nicola Cerantola, Nikolay Neykov, Nina Drejerska, Oriol Guimerà, Owain Griffiths, Patrica Lopez, Petar Antov, Pilar Chiva, Robert Babuka, Rubén Carnerero, Susanna Campogrande, Udo Kiel.

Vi vill också tacka nationella möbelorganisationer som, förutom att de var projektpartners, förberedde analysen av det aktuella läget för övergången till cirkulär ekonomi i deras land:

- APMR - Rumänska möbelproducentföreningen (Romanian Furniture Manufacturers Association) / Rumänien
- BBCWFI - Bulgariska kammaren för träbearbetning och möbelindustri (Bulgarian Branch Chamber of Woodworking and Furniture Industry) / Bulgarien
- CBM - Branschförening för byggnads- och möbelindustrin (Trade association for interior construction and Furniture industry) / Nederländerna
- FCBA - Tekniska institutet för skogsbaserad möbelsektor (Institute of Technology for Forest-based and Furniture Sectors) / Frankrike
- GS - Fackförbundet för skogs,- trä,- och grafisk bransch (The Swedish Union of Forestry, Wood and Graphical Workers) / Sverige

Det var endast möjligt att genomföra SAWYER-projektet tack vare finansieringen från EG: s ansökningsomgång Stöd till social dialog VP / 2018/001.

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Sammanfattning

Dubbelövergången (grön & digital) kommer att ha en stor påverkan på EU:s möbelsektor under de kommande åren och decennierna. Den nya europeiska industriella strategin, den europeiska gröna given och den nya handlingsplanen för cirkulär ekonomi kommer att spela en viktig roll för EU:s branschövergång. SAWYER-projektet, som byggde sin analys av de tidigare resultaten av DIGIT-FUR-projektet med fokus på sektorns digitalisering 2025, syftade till att **analysera de viktigaste instrumenten / drivkrafterna för förändring av övergången** mot en mer **cirkulär ekonomi** inom **EU:s möbelsektor 2030** och förutse **förståelsen för dessa förändringar**. Detta kommer att ge användbar insikt för **alla arbetsmarknadspartner och intressenter inom sektorn** om hur sektorn, dess affärsmodeller och dess anställda kommer att påverkas av denna övergång längs hela värdekedjan fram till 2030.

Projektet har genomförts med **olika partners (CENFIM, EF-BWW, EFIC, FLA** och **UEA)** och andra nationella institutioner (APMR, BBCWFI, CBM, FCBA och GS) med lång och gedigen expertis inom möbelbranschen. Dessutom tillhandahöll andra **enskilda experter** inom cirkulär ekonomi, EU:s yrkesutbildningssystem, arbetsmiljörisker och själva möbelsektorn sin expertis och insatser under hela projektgenomförandet.

SAWYER implementerades enligt en **progressiv forskningsmetodik**. Inledande identifierades de viktigaste rättsliga och frivilliga instrumenten och andra policyer och strategier som påverkar övergången till EU:s möbelsektor mot en mer cirkulär ekonomi. Baserat på detta prognostiserades 49 utvecklingar av dessa instrument och policyer, och deras sannolikhetsnivå och effekt utvärderades genom en **onlineundersökning** av 51 experter från 15 länder. De prognostiserade utvecklingen analyserades och finjusterades i en **workshop** av 20 experter. Resultaten användes för att förutsäga 2030-scenariot för EU:s möbelsektor baserat på cirkulär ekonomi.

I detta scenario, som bygger på de tidigare DIGIT-FUR-projektresultaten och anpassade **ReSOLVE-ramverket** till möbelsektorn, fick man identifiera de **förväntade förändringarna i de viktigaste elva yrkesprofiluppgifterna** på grund av sektorns övergång till en mer cirkulär ekonomi och sektorns digitalisering . Därifrån identifierades de nya **riskerna för arbetsmiljö och hälsa** och förändringarna i **kompetens-, kunskaps- och kompetensbehov**.

Alla rapporter är tillgängliga på:
circularfurniture-sawyer.eu/downloads

De huvudsakliga forskningsresultaten sammanfattas nedan, med början i SAWYER-projektets vision:

År 2030, med en brett **digitaliserad möbelsektor**, kommer den träbaserade möbeltillverkningsindustrin att erbjuda **produkter och tjänster** med **miljömedveten design** baserad på **låg påverkan och spårbara råvaror**, hållbara tillverkningsprocesser och främjande av de **bästa användnings- och återvinningsscenarierna** för material och kasserade produkter. Kunder (B2B eller B2C) kommer att kräva mer detaljerad information om produkter och deras **hållbara egenskaper**, inklusive livscykelindikatorer, och konsumenternas egenmakt kommer att vara nyckeln till att cirkuleringsmålen ska lyckas. Myndigheter (på lokal, nationell och europeisk nivå) kommer att underlätta cirkulariteten genom att öka **hållbara scenarion för uttjänta material** och träbaserade produkter, utvidga **gröna offentliga och privata upphandlingssystem** och främja **policyer för materialeffektivitet**.

I detta scenario kommer **digitala verktyg** att användas omfattande i sektorn av både små, medelstora och stora företag, längs hela deras värdekedja. Dessa digitala verktyg kommer att främja en mer cirkulär ekonomi, **effektivisera tillverkningsprocesserna** och underlätta **spårbarheten** av ämnen, material och produkter. Kunderna kommer att bli bättre informerade om produkternas **hållbara egenskaper** och möbelprodukternas **e-handel kommer att öka**, vilket framkallar förändringar i marknadsföringsaktiviteter och relationen med kunder, i försäljningen och relaterade logistiska aspekter. Detta ramverk kommer att underlätta att ett växande antal möbelproducenter genom **hela sin värdekedja** implementerar olika metoder för cirkulär ekonomi som gör deras hanterings- och produktionssystem mer hållbara. Det kommer att finnas en växande social och lagstiftande efterfrågan på företag att minska sitt **miljöavtryck** och bidra till att tackla den nuvarande klimatförändringen. Cirkulariteten i sektorn är i ett tidigt skede och resultaten kommer att ses på medellång sikt.

Möbelindustrins dubbelövergång innebär **nya utmaningar för arbetsmiljö och -hälsa**. **Nya typer av arbetsplatser, nya processer, ny teknik** och **nya material / produkter** kan påverka arbetstagarnas säkerhet och hälsa, men om de ordentligt planeras och distribueras kan **arbetstagarnas hälsa och säkerhet** tydligt förbättras. Av denna anledning måste vi se till att denna övergång och dess nya teknik eller arbetsprocesser inte leder till nya faror. **Cirkulär ekonomi inom sektorn**, som tar hänsyn till arbetsmiljö och miljöfrågor, bör **implementeras genom säkrare och effektivare maskiner, arbetsprocesser och material** som kan minska arbetstagarnas kemiska och fysiska risker. Tillämpningen av **ekodesign**koncept på produkter bör underlätta återvinnings- och reparationsåtgärder, minska ergonomiska risker och bör minska halten av farliga ämnen och minska kemiska risker i hela värdekedjan. Arbetarnas säkerhet och hälsa kan öka genom att integrera arbetsmiljöhanteringen i företagens kvalitetsstyrningssystem.

För vissa yrkesprofiler krävs **nya gröna färdigheter**, eftersom det kommer att finnas vissa nya, specifika uppgifter relaterade till demontering och återanvändning, omtillverkning, återvinning och upcycling. Dessa nya färdigheter är särskilt (mer) viktiga för de "praktiska" profilernas uppgifter. Dessa nya gröna färdigheter kommer också att ha en inverkan, men inte lika signifikant, på de profiler som hanterar och fattar strategiska beslut inom företaget. Dessutom **definierades generiska gröna färdigheter, kunskaper och kompetenser** som nödvändiga för social, ekonomisk och miljömässig utveckling inom trämöbelbranschen. Dessa generiska gröna färdigheter är i linje med nyckelkompetenser eller mjuka färdigheter, som har kontextualiserats inom perspektivet av miljömedvetenhet och förståelsen för hållbar utveckling och cirkulär ekonomi.

Projektets resultat kommer att underlätta och stödja den sociala dialogen mellan sektorns nyckelaktörer och intressenter och göra det möjligt för dem att på ett korrekt sätt stödja möbelsektorns dubbelövergång och hantera de kommande årens utmaningar och **säkerställa arbetstagarnas anställbarhet och säkerhet samt företagens konkurrenskraft**.

Introduktion

Mål

Det övergripande SAWYER-målet var att **förstå och förutsäga** hur EU:s möbelsektor kommer att påverkas av dess **övergång till cirkulär ekonomi** och ge användbar insikt till **alla arbetsmarknadspartner och intressenter inom sektorn** om hur sektorn, dess affärsmodeller och dess anställda kommer att påverkas av denna övergång, **längs hela värdekedjan 2030**. Längs projektimplementeringen såg partnerna att denna cirkularitetsövergång var nära relaterad till sektorns digitalisering och beslutade att bygga analysen på de befintliga resultaten från det tidigare DIGIT-FUR-projektet, som prognostiserade effekterna av sektorns digitalisering 2025. Sammanfattningsvis är det viktigaste resultatet av SAWYER-projektet en prognos över **effekterna av dubbelövergången (grön och digital) på EU:s möbelsektor**, i allmänhet i förhållande till sektorns affärsmodeller, yrkesutbildning och yrkeshälsa, och särskilt för elva viktiga yrkesprofiler.

Denna prognos för dubbelövergången kommer att underlätta sektorsintressenter som **förväntar sig de förändringar som krävs** för att förbättra och uppdatera arbetstagarnas kompetens och deras säkerhet på jobbet, för att säkra EU-möbelföretagens konkurrenskraft under de kommande åren eller till och med årtionden.

SAWYER:s specifika mål var:

- Förstå den **nuvarande statusen och trenderna** inom EU:s möbelsektor inom lagstiftning och frivilliga instrument för cirkulär ekonomi.
- Definierar det **framtida möjliga sektorscenariot 2030** på grund av dess cirkulära ekonomiövergång.
- Identifiera **effekterna** av detta scenario på **viktiga yrkesprofiler inom sektorn, arbetsmiljörisker och kompetens- och kunskapsbehov**.
- Förutsäga **vad intressenter inom sektorn kan förvänta sig** på grund av dessa förändringar och hur de kan hanteras.
- Stödja arbetet med den **europeiska sociala dialogen** och förbättra europeiska arbetsmarknadsrelationer.
- **Kartlägg framgångsrika initiativ** för att stödja intressenter i implementeringsprocesser för cirkulär ekonomi.

Metod

Forskningsmetoden som antagits av partnerskapet (figur 1) utformades av CENFIM SAWYER-teamet (M. Rumignani, J. Rodrigo, J. Solana) och projektets externa expert inom cirkulär ekonomi, Juan Carlos Alonso och den implementerades med stöd av de andra SAWYER-partnerna (FLA, EFBWW, EFIC och UEA) och de andra två externa experterna i projektet, Jeroen Doom (yrkesutbildningssystem) och Ellen Schmitz-Felten (arbetsmiljörisker). Studien började med att identifiera de **viktigaste rättsliga och frivilliga instrumenten och andra policyer och strategier** som kan påverka övergången till EU:s möbelsektor mot en mer cirkulär ekonomi.

Figur 1 - Schema för projektmetod

För att stödja denna analys utarbetades en specifik rapport om de **aktuella läget för dessa instrument och policyer** på europeisk nivå och i sju EU-länder (Spanien, Italien, Frankrike, Nederländerna, Rumänien, Bulgarien och Sverige). Baserat på detta prognostiserades 49 utvecklingar av dessa instrument och policyer, och deras sannolikhetsnivå och effekt utvärderades genom en **onlineundersökning** som innefattade 50 experter från 15 EU-länder, experter på cirkulär ekonomi och/eller i möbelsektorn.

När undersökningsresultaten samlades in, utarbetades och sammanfattades analyserades de 49 prognostiserade utvecklingarna och finjusterades i en **workshop** av 20 yrkesverksamma från 9 EU-länder med olika expertis, allt från möbelsektorn, ekodesign och specifik lagstiftning och frivilliga instrument inom cirkulär ekonomi. Som slutresultat av denna process **producerades rapporten "Prognostiserat scenario för möbelbranschen i förhållande till cirkulär ekonomi 2030"**. Den förutspår status för EU:s möbelsektor 2030 baserat på det prognostiserade scenariot för 2025 i det tidigare DIGIT-FUR-projektet, som analyserade effekterna av digitalisering på sektorn. Resultatet har varit en prognos och analys av effekterna av **dubbelövergången (grön & digital)** på EU:s möbelsektor under de kommande åren och decennierna.

Baserat på dessa resultat identifierade projektets cirkulära ekonomi i samarbete med CENFIM SAWYER-projektteamet och byggde på de tidigare DIGIT-FUR-projektresultaten de **förväntade förändringarna i elva viktiga yrkesprofilers uppgifter** på grund av sektorns övergång mot en mer cirkulär ekonomi och sektorns digitalisering. Analysen implementerades genom att anpassa **ReSOLVE-ramverket**, utvecklat av McKinsey Center och Ellen MacArthur Foundation, till möbelbranschen. Så, de nya prognostabellerna innehåller de förväntade resultaten från dubbelövergången (grön & digital) inom möbelsektorn, vilket ger en tydlig bild av de förväntade framtida uppgifterna för alla elva yrkesprofiler.

GÅ TILL INDEX

Följande steg var analysen av nuvarande och prognostiserade **risker och riskförändringar för arbetsmiljösäkerhet** på grund av sektorns digitalisering och övergång till cirkulär ekonomi med beaktande av omformuleringen av de uppgifter som gjorts i den tidigare analysen för de olika yrkesprofilerna. I denna analys har de olika typerna av risker som arbetstagare från tillverkare av trämöbler kan utsättas för placerats i olika kategorier av risker.

Det sista steget var analysen av hur de nuvarande arbetstagarnas och företagens **kunskaper, färdigheter och kompetenser** (KSC) kan förändras på grund av sektorns digitalisering (2025) och cirkulär ekonomi (2030) för de viktigaste elva yrkesprofilerna, med hänsyn till "främsta orsaker till förändring" för digitalisering och för cirkulär ekonomi och analys om de kommer att fortsätta behövas eller inte. Denna analys gör det möjligt att identifiera vilka KSC-behov som kommer att drabbas av förändringar och vilka nya kompetenser som krävs för den cirkulära ekonomin av sektorföretag som är villiga att anpassa sig till och på rätt sätt utnyttja de möjligheter som sektorns växande cirkularitet erbjuder.

Baserat på en ytterligare analys och utarbetande av alla dessa resultat- och utgångsexperter och SAWYER-partnerskapet framställdes en **uppsättning rekommendationer** för intressenter i möbelbranschen i allmänhet och specifikt för beslutsfattare, yrkesutbildningsleverantörer och tillsynsenheter.

En kartläggning av **europeiska initiativ** som underlättar och stöder övergången för EU:s branscher mot en mer cirkulär ekonomi gav information om olika relevanta nationella och regionala initiativ.

De viktigaste 11 yrkesprofilerna som valts ut och analyserades från ESCO-klassificeringen (europeisk klassificering av färdigheter, kvalifikationer och yrken) med tillhörande ISCO-identifieringskod:

1221	Försäljnings- och marknadschefer
1321s	Chefer inom tillverkning
1324s	SCM-chef (Inköps- och distributionschefer m.fl.)
2141s	Underhålls- och reparationsingenjör (maskinunderhåll och reparationsarbetare)
2163s	Möbeldesigner (Industri- och modedesigners)
7522	Möbelsnickare m.fl.
7523	Trämaskinställare och trämaskinskötare
7534	Tapetserare m.fl.
8172	Sågverksoperatörer
8219s	Möbelmontörer
9329	Övriga fabriksarbetare

Resultat

Det aktuella läget inom cirkulär ekonomi i möbelsektorn i EU

Analysområdet som omfattades av SAWYER-projektet var möbelsektorn som enligt NACE Rev. 2-klassificeringen hänvisar till kod 31.0 (Tillverkning av möbler). Den har en omsättning på 110,4 miljarder euro och ett mervärde på 32% (enligt senaste EUROSTAT-uppgifter från 2018), vilket gör den till en mycket relevant sektor för EU-ekonomin också på grund av sektorns 1.043.806 arbetstagare (EUROSTAT, 2018) . EU28-möbelsektorn består till stor del av mikroföretag, småföretag och medelstora företag, vilket visas i följande tabell.

Följande tabell visar uppgifter om sektorns arbetstagare i förhållande till de viktigaste arbetsrollkategorierna och de profiler som analyserats av SAWYER-projektet.

Tabell 1. - Volym arbetstagare för huvudkategorierna inom EU:s möbelsektor 2018.

Arbetsrollkategorier [1]	Ung. volym 2018, 1.043.806 arbetstagare[2]	Professionella profiler använda i SAWYER-projektet (ISCO yrkesprofiler)
Chefer	80.395	Omfattas ej av denna studie
IKT-specialist	11.485	Omfattas ej av denna studie
Designers	10.818	2163s Möbeldesigner
Produktionschef	22.970	1321s Chefer inom tillverkning
Försäljnings- och marknadsföringspersonal	22.970	1221 Försäljnings- och marknadsföringschefer + ytterligare profiler som inte omfattas av denna studie
SCM-chefer	10.818	1324s SCM-chef
Administrativ supportpersonal	114.851	Omfattas ej av denna studie
Arbetstagare inom underhåll och reparation av anläggningar och maskiner	68.910	2141s Underhålls- och reparationsingenjörer + ytterligare profiler omfattas inte av denna studie
Kvalificerade hantverksarbetare (möbelsnickare och tapetserare)	574.255	7522 Möbelsnickare m.fl.
		7534 Tapetserare
		8219s Möbelmontörer
Maskinoperatörer	45.941	7523 Trämaskinställare och trämaskinskötare
		8172 Sågverksoperatörer
Arbetstagare	80.395	9329 Övriga fabriksarbetare

[1]Arbetsrollkategorier från studien TNO, ZSI, SEOR (2009), EC.
[2]Baserat på utarbetandet av EUROSTAT-uppgifter om det totala antalet arbetstagare inom EU 28-möbelsektorn.

Efter identifieringen av uppsättningen av **de viktigaste lagstiftade och frivilliga instrumenten** och andra **policyer** och strategier som påverkar EU-möbelsektorns **övergång mot en mer cirkulär ekonomi** genomfördes en detaljerad analys av deras implementeringsnivå.

I den första projektrapporten "Det aktuella läget inom cirkulär ekonomi i möbelsektorn", utarbetad senast i november 2019, har partnerskapet genomfört en detaljerad analys av alla dessa element och av deras implementeringsnivå, både på EU-nivå och sedan specifikt på vissa EU-länders nivå. länder (Frankrike, Italien, Spanien, Rumänien, Nederländerna, Sverige, Bulgarien). Denna relaterade kunskap anses nödvändig av partnerskapet för att korrekt förstå och förutsäga utvecklingen av cirkulär ekonomi i sektorn.

De valda instrumenten grupperades i tre olika grupper: lagstiftningsinstrument, frivilliga instrument och andra policyer och strategier. Deras detaljerade beskrivning och resultaten av deras analys har samlats i tre olika dokument:

- Det aktuella läget inom cirkulär ekonomi i möbelsektorn på EU-nivå
- Det aktuella läget inom cirkulär ekonomi i möbelsektorn i 7 EU-länder
- Sammanfattningstabell: Uppdatering av det aktuella läget inom cirkulär ekonomi i möbelsektorn på EU-nivå

Alla dessa dokument kan laddas ner på SAWYER-projektets webbplats: circularfurniture-sawyer.eu/downloads

Följande tabell visar listan över valda instrument och policyer och deras beräknade implementeringsnivå på EU-nivå, på en skala mellan 1 och 5 (1 = minimivärde och 5 = maximivärde).

Tabell 2 - Lista över utvalda instrument och policyer och deras implementeringsnivå på EU-nivå

Instrument	Beskrivning	Implementeringsnivå
Lagstiftningsinstrument		
EC:s paket för cirkulär ekonomi	Handlingsplanen för cirkulär ekonomi (COM (2015) 614) syftar till att öka genomförandet av cirkulär ekonomi i Europa. Det inkluderar översyn av vissa regler (t.ex. ramverk för avfall) och andra åtgärder för att främja cirkularitet (t.ex. plaststrategi).	**5** Alla de 54 föreslagna åtgärderna har slutförts eller befinner sig i implementeringsfasen {SWD (2019) 90 slutgiltig}.
Europeiska gröna given	Europeiska gröna given (COM (2019) 640 slutgiltig och bilaga) är EU:s färdplan för att göra EU:s ekonomi mer hållbar med åtgärder för att: • öka den effektiva resursanvändningen genom att gå över till en ren, cirkulär ekonomi • återställa biologisk mångfald och minska föroreningar • Målet är att EU ska vara klimatneutralt 2050 och göra övergången rättvis och inkluderande för alla. Detta kommer att kräva åtgärder från alla sektorer i EU:s ekonomi, inklusive: • investera i miljövänlig teknik • stödja industrin för innovation • lansera renare, billigare och hälsosammare former av privat trafik och kollektivtrafik • avkolning av energisektorn • säkerställa att byggnader är mer energieffektiva • samarbeta med internationella partners för att förbättra globala miljöstandarder	**2** I sin punkt 2.1.3. Mobilisera industrin för en ren och cirkulär ekonomi tillkännager den att kommissionen kommer att anta en EU-industristrategi och offentliggöra en ny handlingsplan för cirkulär ekonomi som grundpelare i EU:s gröna giv (gjort i mars 2020). I bilagan till meddelandet om den europeiska gröna given definieras färdplanen och nyckelåtgärden, från 2019 till 2021. Dessa nyckelåtgärder klassificeras i följande aspekter: • Klimatambition • Ren, prisvärd och säker energi • Industriell strategi för en ren och cirkulär ekonomi • Hållbar och smart mobilitet • Göra den gemensamma jordbrukspolitiken grönare / "Gård till gaffel"-strategin • Bevara och skydda biologisk mångfald • Mot en ambition utan föroreningar för en giftfri miljö • Integrera hållbarhet i all EU-politik • EU som global ledare • Arbeta tillsammans - en europeisk klimatpakt
Ny handlingsplan för cirkulär ekonomi för ett renare och mer konkurrenskraftigt Europa	Den nya handlingsplanen för den cirkulära ekonomin (COM (2020) 98 slutgiltig och bilaga) tillkännager initiativ under hela livscykeln för produkter, med till exempel inriktning på deras design, främjande av processer för cirkulär ekonomi, främjande av hållbar konsumtion och syfte att säkerställa att de resurser som används behålls i EU:s ekonomi så länge som möjligt.	**1** Planen anger i sin bilaga tidpunkten för de föreslagna initiativen, från 2020 till 2023. Nyckelåtgärderna klassificeras i följande aspekter: • En hållbar produktpolitisk ram • Viktiga produktvärdekedjor • Mindre avfall, mer värde • Att få cirkularitet att fungera för människor, regioner och städer • Tvärgående åtgärder • Ledande insatser på global nivå • Bevakning av förloppet
Direktiv om avfall från elektrisk och elektronisk utrustning (WEEE)	I direktivet 2012/19/EU krävs att det inrättas insamlingssystem (gratis för konsumenter) för att öka återanvändning och / eller återvinning av elutrustning.	**5** Det tidigare WEEE-direktivet trädde i kraft 2003. År 2017 antog kommissionen "WEEE-paketet" och 2018 en slutrapport om WEEE-efterlevnad och undersökte genomförandet i varje EU-land.
Begränsning av användningen av farliga ämnen i elektrisk och elektronisk utrustning (ROHS)	Direktiv 2011/65/EU ändrades genom direktivet (EU) 2017/2102, där man granskade räckvidden för en viss produktgrupp och underlättade att uppmuntra en mer cirkulär ekonomi i unionen genom att främja sekundära marknader för elutrustning, som innebär reparation, byte av reservdelar, renovering och återanvändning och eftermontering.	**5** Det tidigare ROHS-direktivet trädde i kraft 2003. Det granskades flera gånger för att ändra undantagen och deras tidsfrister.
Direktivet om energirelaterade produkter (ErP eller ekodesign)	Direktivet 2009/125/EG är ramverket för att definiera krav på ekodesign för produkter som använder energi eller som är energirelaterade (dvs. de förbrukar inte energi direkt men kan framkalla användningen av ytterligare energi, till exempel fönster).	**4** EC publicerar arbetsplaner för att identifiera prioriterade familjeprodukter och framtida strategier. Den senaste arbetsplanen täcker perioden 2016-2019 och ger mer uppmärksamhet åt resurseffektivitet, analyserar den möjliga tillämpningen av ytterligare "produktspecifika" krav i frågor som hållbarhet etc.

Instrument	Beskrivning	Implementeringsnivå
Utökat producentansvar (EPR)	Det utvidgade producentansvaret (EPR) är ”ett miljöpolitiskt tillvägagångssätt där en producents ansvar för en produkt utvidgas till post-konsumentstadiet i en produkts livscykel”.	**4** Befintliga direktiv på EU-nivå för vissa specifika produkter (elutrustning, batterier, uttjänta fordon, förpackningar etc.). På nationell nivå finns EPR-system för andra produkter.
Farliga ämnen / REACH-förordningen	REACH-förordningen (EG 1907/2006) har som mål att förbättra människors hälsa och miljöskydd genom att identifiera de farliga egenskaperna hos kemiska ämnen som används i EU. Både tillverkare och importörer har ansvaret för att samla in information om de specifika och kritiska egenskaperna hos kemiska ämnen de använder.	**3** REACH är fullt operativt men släpar efter de initiala förväntningarna. Några identifierade problem är bland annat bristen på kompatibel information i registreringsunderlagen och behovet av förenkling av auktoriseringsprocessen.
Formaldehydutsläpp	Den formaldehyd som produceras och importeras på europeisk nivå används främst för tillverkning av hartser som används för tillverkning av träbaserade paneler. Exponeringen för formaldehydutsläpp är en viktig fråga för konsumenter (utsläpp från artiklar) och för arbetstagare (yrkesmässig exponering).	**2** På europeisk nivå finns det inte ett gemensamt lagkrav, men det finns ett frivilligt branschavtal mellan medlemmarna i European Panel Federation (EPF), som bara producerar träbaserade paneler av klass E1. Vissa EU-medlemsstater har antagit nationella lagstiftningar. I EU är den nuvarande koncentrationsgränsen värdet för arbetsplatser är 0,3 mg / m³
EU-regler om avfallskriterier för uttjänta produkter	Avfallsramdirektivet 2008/98/EG anger att vissa specifika avfall ska sluta betraktas som vanligt avfall om det har genomgått en återvinningsprocess (inklusive återvinning) och om det uppfyller specifika kriterier som utvecklats i enlighet med vissa rättsliga villkor. Målet är att avlägsna de administrativa bördorna i avfallslagstiftningen för säkra och högkvalitativa avfallsmaterial, för att underlätta återvinningen av dem.	**3** På europeisk nivå har kriterierna definierats för åtta typer av avfall, men det finns specifika föreskrifter för skrot av järn, stål, koppar, aluminium och krossglas.
Flamskyddsmedel	Vissa möbelprodukter använder flamskyddsmedel för att uppfylla olika brandfarlighetsstandarder för möbler. Vissa av dessa standarder kräver test med öppen låga, vilket framtvingar användningen av flamskyddsmedel. Vissa typer av ämnen som används för flamskyddsmedel regleras i förordningen (EU) 2019/1021, som omarbetar förordningen (EG) 850/2004 om långlivade organiska föroreningar (POP).	**3** Användningen av flamskyddsmedel regleras inte direkt på europeisk nivå. Indirekt regleras det om de använda ämnena anses vara farliga (t.ex. via REACH- eller POP-förordningen). De nämnda reglerna är väl implementerade och nya ämnen är under utredning.
Direktivet om förnybar energi (RED II)	I december 2018 trädde det reviderade direktivet om förnybar energi 2018/2001/EU i kraft som en del av paketet Ren energi för alla européer. Det fastställer ett nytt bindande mål för förnybar energi för EU för 2030 på minst 32%, med en klausul för en eventuell upprevidering senast 2023. Direktivet om förnybar energi anger hållbarhetskriterier för biodrivmedel för alla biodrivmedel som produceras eller konsumeras i EU.	**4** Direktivet används och mer ambitiösa mål för förnybar energi övervägs. När det gäller hållbarhet för biodrivmedel kan företag visa att de uppfyller hållbarhetskriterierna genom nationella system eller så kallade frivilliga system som erkänns av Europeiska kommissionen.
Olaglig avverkning och olaglig timmerhandel	Förordningen (EU) nr 995/2010 definierar skyldigheterna för operatörer som säljer eller distribuerar virke och träprodukter. Det är känt som EU: s timmerförordning eller EUTR, som en del av EU:s handlingsplan för Skogslagstiftning, -styrning och -handel (FLEGT). Ett annat system är konventionen om internationell handel med utrotningshotade arter av vilda djur och växter (CITES).	**5** Dessa regler och handlingsplaner används på EU-nivå och internationell nivå. Nya handlingsplaner för att skydda skog publiceras, till exempel COM (2019) 352 final om "Att intensifiera EU:s åtgärder för att skydda och återställa världens skogar", där man föreslår inrättandet av ett EU-observatorium för avskogning och skogsnedbrytning.

Instrument	Beskrivning	Implementeringsnivå
Frivilliga instrument		
Grön offentlig upphandling (GPP)	Grön offentlig upphandling införlivar miljökriterier i specifikationerna för ett offentligt anbud, som involverar integreringen av miljökomponenterna i beslut om offentlig upphandling. Dessa miljökriterier kan täcka olika aspekter av produkterna under deras livscykel. GPP kan främja skapandet av en kritisk efterfrågan av mer hållbara varor och tjänster, som annars inte skulle vara lätt att få in på marknaden.	**3** Nivån av faktisk implementering är olika i varje EU-land. Europeiska kommissionen och flera EU-länder har utarbetat olika riktlinjer för GPP-processer i form av nationella GPP-kriterier. De största utmaningarna är att säkerställa kompatibla GPP-krav mellan olika EU-länder och att få fler offentliga organ att anta dessa kriterier.
Miljöledning i organisationer	Ett miljöledningssystem (EMS) kan hjälpa organisationer att identifiera, hantera, bevaka och kontrollera sina miljöaspekter på ett "holistiskt" sätt. På europeisk nivå finns det två huvudsakliga certifierade miljöledningssystem, EMAS och ISO-14001: 2015.	**4** Olika versioner av ISO- och EMAS-systemen har publicerats. De är konsoliderade system men delvis implementerade i näringslivet. På EU-nivå har 3728 organisationer EMAS-certifiering (april 2019) och 111133 ISO-14001-certifieringar (2017).
Miljödesignmetodik	Miljödesign definieras som "integrering av miljöaspekter i produktdesign och utveckling i syfte att minska negativ miljöpåverkan under en produkts hela livscykel". UNE-EN ISO 14006:2020 innehåller riktlinjer för att hjälpa organisationer att upprätta, dokumentera, implementera, underhålla och ständigt förbättra sin hantering av ekodesign som en del av ett EMS. Det finns andra standarder relaterade till ekodesign, som UNE-ISO /TR 14062:2007 eller IEC 62430:2019	**3** Den senaste revideringen av ISO 14006 gjordes år 2020. Standarden indikerar att den inte är avsedd för certifieringsändamål, vilket gör det svårt att känna till den verkliga implementeringsnivån på marknaden. I vilket fall antas att denna implementering är mycket lägre än ISO-14001.
Miljömärkning (typ I, II och III)	Miljömärkena försöker ge kunderna information om en produkts miljöegenskaper. Det finns en enorm mängd olika miljömärken, men alla kan ingå i tre huvudtyper av miljömärken (dvs. I, II och III) och de regleras enligt ISO 14020.	**4** De olika miljömärkningssystemen är väl utvecklade och används i stor utsträckning i någon typ av produkter (t.ex. konsumentprodukter). Det behövs dock ytterligare arbete för att bättre informera konsumenterna om miljömärkningens verkliga innebörd för att undvika missförstånd.
Spårbarhetscertifikat (FSC / PEFC)	Spårbarhetscertifikatet för skogsbaserade material och produkter bevisar att den certifierade produkten kommer från certifierade, välskötta skogar. Det verifierar och säkerställer att dessa produkter inte blandas med andra produkter från icke-certifierade skogar vid någon punkt längs försörjningskedjan, förutom under strikta kontroller när procentmärkning (%) används. Det finns för närvarande två oberoende ackrediterade program för spårbarhetscertifikat inom träindustrin: FSC (Forest Stewardship Council) och PEFC (Program for the Endorsement of Forest Certification) -scheman.	**5** Dessa två system är väl utvecklade och efterfrågan på spårbarhetscertifiering har ökat dramatiskt under de senaste tre åren, i den utsträckning att för många företag är nu möjligheten att bevisa att en träprodukt härrör från en välskött källa en nyckelfaktor i specifikationen av virke och pappersprodukter.
Grön byggnadscertifiering (BREEAM / LEED)	Det finns två huvudsakliga certifieringssystem för gröna byggnader: Building Research Establishment's Environmental Assessment Method (BREEAM), som var det första systemet för grön byggnadsklassificering som utvecklades i Storbritannien, och Leadership in Energy and Environmental Design (LEED) som utvecklades nyligen i USA av Green Building Council (USGBC).	**4** Dessa två system är väl implementerade på EU-nivå. Till exempel är 19 542 BREEAM-bedömningar certifierade i EU-länder (de flesta i Storbritannien) och 3766 LEED-certifierade projekt. Det finns en ökande efterfrågan på denna typ av certifiering, men det är fortfarande en liten del av hela byggnadssektorn.

Instrument	Beskrivning	Implementeringsnivå
Andra instrument och policyer		
Kaskadanvändning av trä	Kaskadanvändning av biomassaresurser, som trä och jordbruksprodukter, innebär en effektiv användning av dessa resurser med synpunkt på naturresurser, material och markförbrukning. Den prioriterar användningar med högre värde som möjliggör återanvändning och återvinning av produkter och råvaror, och energianvändning endast när andra alternativ inte är möjliga.	**2** Europeiska kommissionen har publicerat två relevanta publikationer om denna fråga, inklusive vägledning om kaskadanvändning av biomassa. Fram till dags dato finns inga andra krav kopplade till detta ämne.
EU:s industripolitik för skogsbruk	EU-kommissionen antog EU:s skogsstrategi 2013 (COM(2013) 659 slutgiltig), som syftar till att hjälpa skogssektorn att ta itu med nuvarande utmaningar. Strategin ger en ram för att svara på de ökande kraven på skogssektorn och för att hantera samhälleliga och politiska förändringar. EU:s skogsstrategi 2014-2020 utvecklades för att ge en sammanhängande ram för både EU:s skogsrelaterade politik och de nationella skogsbrukspolicyerna i de enskilda EU-länderna.	**4** År 2018 levererade kommissionen rapporten "Framsteg i genomförandet av EU:s skogsstrategi" (COM (2018) 811 slutlig) som granskade denna strategi. Granskningen belyser att EU:s skogsstrategi uppnår sitt mål att främja en mer hållbar skogsförvaltning på EU-nivå och global nivå.
Plan för skogsbaserade industrier	2013 publicerade Europeiska kommissionen en plan för EU:s skogsbaserade industrier (SWD(2013) 343 slutgiltig). Detta dokument åtföljer EU:s skogsstrategi och det lyfter fram de utmaningar som den skogsbaserade industrin måste ta itu med för att förbli konkurrenskraftig.	**3** Vissa åtgärder har identifierats för att hantera dessa utmaningar under tidsramen 2014-2020. En grupp organisationer har presenterat sin gemensamma strategiska vision och agenda fram till 2050 för skogsbaserade industrier.
Bioekonomi	Målet med bioekonomi är en mer innovativ ekonomi med låga utsläpp, som integrerar krav på hållbart jordbruk och fiske, livsmedelssäkerhet och hållbart utnyttjande av förnybara biologiska resurser för industriella ändamål, samtidigt som biologisk mångfald och miljöskydd säkerställs.	**3** Europeiska kommissionen har fastställt en bioekonomisk strategi och handlingsplan, som publicerades 2012 och reviderades 2018. Denna uppdatering utformade en handlingsplan med 14 konkreta åtgärder som ska lanseras 2019. Dessutom arbetar kommissionen med att säkerställa en sammanhängande strategi för bioekonomi genom olika program och instrument (t.ex. Horisont 2020, BBI, etc.).

Prognos: resultat av undersökning och workshop

Stegen var att organisera en **online-undersökning och en workshop för experter.** Undersökningen genomfördes bland 50 yrkesverksamma från 15 EU-länder och stöddes av rapporten om det aktuella läget som tidigare framtagits. Experter inom cirkulär ekonomi och / eller inom möbelsektorn ombads att utvärdera sannolikhetsnivån och effekterna av 49 prognostiserade utvecklingar som förväntades tills 2030 och relaterade till de tidigare identifierade påverkande instrumenten och policyerna.

Undersökningsmålen var:

- Identifiera **vilka utvecklingar som är troligast** att ske innan **2030**.
- Skapa ett **första utkast till en lista med de situationer med högst påverkan som sektorn kommer att stå inför 2030**.

Undersökningsresultaten gjorde det möjligt att rangordna listan över dessa 49 prognostiserade utvecklingar i förhållande till deras **sannolikhet** att inträffa och relevansen av deras **inverkan** på sektorövergången mot en mer cirkulär ekonomi, vilket visar för sektorns intressenter vilka av dessa instrument de bör ägna mer uppmärksamhet åt för att kunna klara de utmaningar som övergången till cirkulär ekonomi innebär.

När undersökningsresultaten samlades in, utarbetades och sammanfattades analyserades och diskuterades de i december 2019 i en workshop av 20 yrkesverksamma från 9 EU-länder med olika expertis, allt från möbelsektorn, ekodesign och specifik lagstiftning inom cirkulär ekonomi. Experternas gemensamma brainstorming och insatser hjälpte oss att uppdatera och finjustera de 49 prognostiserade utvecklingarna och förbättra prognosen för hur sektorn kommer att utvecklas till 2030.

Som slutresultat av dessa processer **producerades rapporten "Prognostiserat scenario för möbelbranschen i förhållande till cirkulär ekonomi 2030"**. Den innehåller det prognostiserade scenariot i förhållande till effekterna av sektorövergången mot en mer cirkulär ekonomi, byggt på det tidigare prognostiserade scenariot för DIGIT-FUR-projektet med fokus på sektorns digitala omvandling fram till 2025. Denna nya prognos kan stimulera ett mer omfattande tänkande om framtida strategiska aktiviteter och investeringar. Visionen är:

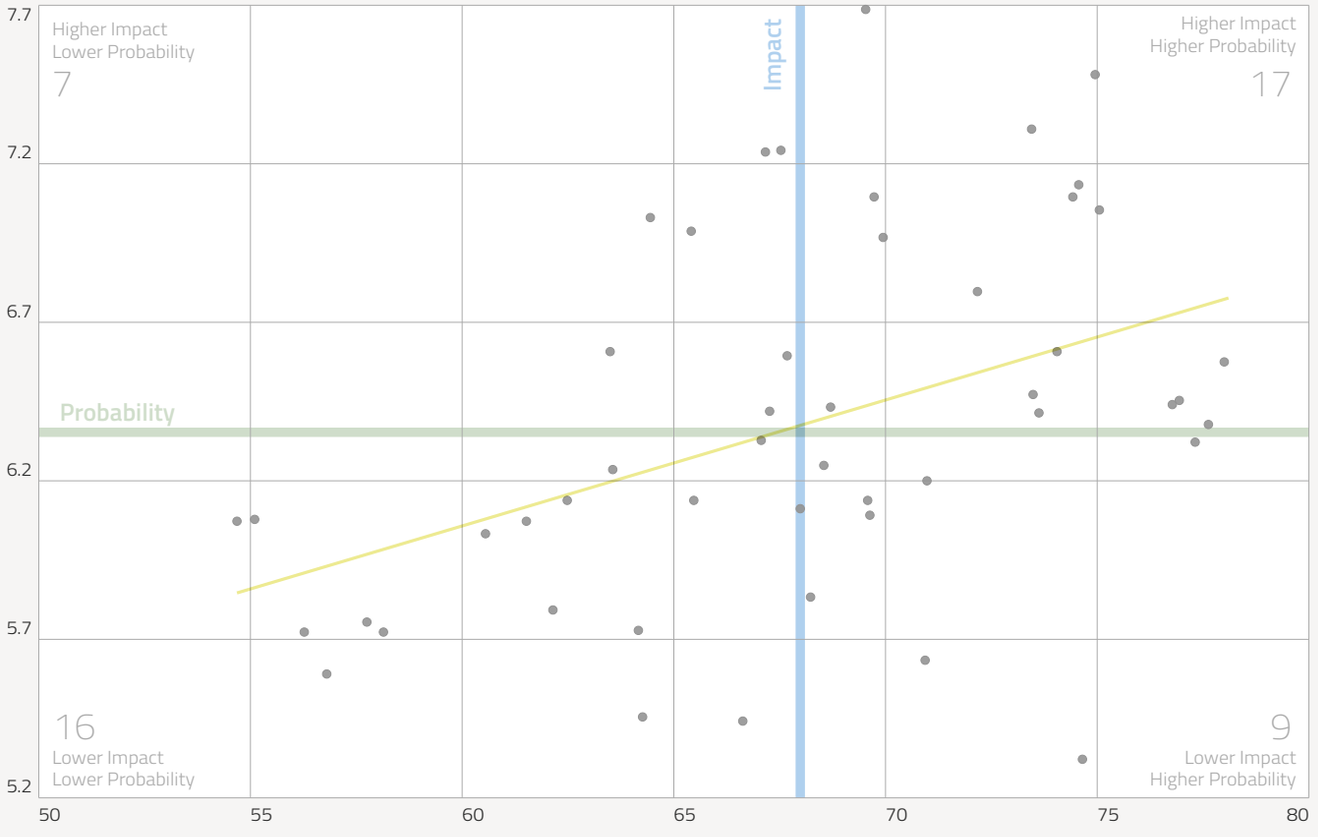
*År 2030, med en brett **digitaliserad möbelsektor**, kommer den träbaserade möbeltillverkningsindustrin att erbjuda **produkter och tjänster** med **miljömedveten design**baserad på **låg påverkan och spårbara råvaror, hållbara tillverkningsprocesser** och främjande av de **bästa användnings- och återvinningsscenarierna** för material och kasserade produkter. Kunder (B2B eller B2C) kommer att kräva mer detaljerad information om produkter och deras **hållbara egenskaper**, inklusive livscykelindikatorer, och konsumenternas egenmakt kommer att vara nyckeln till att cirkuleringsmålen ska lyckas Myndigheter (på lokal, nationell och europeisk nivå) kommer att underlätta cirkulariteten genom att öka **hållbara scenarion** för uttjänta material och träbaserade produkter, utvidga **gröna offentliga och privata upphandlingssystem** och främja **policyer för materialeffektivitet**.*

Denna vision visar tydligt det **nära sambandet mellan sektorövergången mot en mer cirkulär ekonomi och dess digitala omvandling**. Dessa två utvecklingar har kombinerade, starka och långsiktiga effekter på varandra och endast en **gemensam analys** av deras effekter kan ge en realistisk och användbar prognos för hur möbelsektorn kommer att bli under de kommande åren och årtiondena och därmed **stödja de strategiska besluten i sektorns intressenter**.

De fullständiga rapporterna finns på: circularfurniture-sawyer.eu/downloads/

Bilden visar att det inte finns någon tydlig korrelation mellan utvecklingars påverkan och sannolikhet och att vi saknar utvecklingar med påverkan lägre än 5 och högre än 8 på 0-10-skalan.

Figur 2.- Fördelning av de 49 prognostiserade utvecklingarna i förhållande till deras sannolikhet och påverkan.



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 deviation	Impact Mean Value	Impact Standard deviation
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 ≥ 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
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

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
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

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
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
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

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
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

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 Environmental Management Systems ISO14001/EMAS
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

Koncept och ramar som beaktas för analys av förändrade yrkesprofiler

I det här avsnittet presenterar vi ramarna och koncepten vi använde för att implementera analysen av effekterna av övergången till den cirkulära ekonomin på EU:s möbelsektor inom perspektivet för sektorns dubbelövergång. Som underlag för analysen använde vi ramarna för ReSOLVE-medel som utvecklats av McKinsey Center och Ellen MacArthur Foundation (Growth Within: A Circular Economy Vision for a Competitive Europe, 2015 bit.ly/2MreFWM) och vi analyserade hur de olika medlen påverkade yrkesprofilerna för befintliga uppgifter och efter hand skapade nya.

Baserat på förändringarna i arbetsprofilsuppgifterna identifierade vi utvecklingen av arbetsmiljöriskerna och kompetensbehovet från möbelbranschens övergång till en mer cirkulär ekonomi. I följande avsnitt presenterar vi dessa ändringar för var och en av de elva profilerna genom olika tabeller som senare presenteras.

De fullständiga rapporterna finns på: circularfurniture-sawyer.eu/downloads/

Förklaring av ReSOLVE-medel

Denna första tabell beskriver kort de medel som identifierats av McKinsey Center och Ellen MacArthur Foundation som viktiga acceleratorer för övergången till en mer cirkulär ekonomi. Dessa medel har i viss grad anpassats till möbelbranschen av oss.

Tabell 4 - Förklaring av ReSOLVE-medel med hänsyn till möbelsektorn

	Medel	Kort beskrivning
Regenerera	Växla till förnybar energi	Använd huvudsakligen förnybar energi, till exempel sol, vind, inklusive biomassa (t.ex. möjlig användning av trärester som energikälla).
	Växla till förnybara material	Använda träbaserade material från mer hållbara källor eller byt ut andra material (t.ex. plast, metaller eller textildelar) mot förnybara alternativ.
	Återta, behåll och återskapa ekosystemens hälsa	Underlätta förnyelsen av ekosystem som skadas av deras verksamhet, till exempel främja hållbar förvaltning av skogar och plantager, markförnyelse, bevarande av biologisk mångfald etc.
	Returnera återvunna biologiska resurser till biosfären	Underlätta återförandet av träavfall till biosfären (t.ex. återföring av träförbränningsaska som näringsämnen till skogen etc.).
Dela	Minska ersättningshastigheten för produkter och öka produktanvändningen genom att dela den mellan olika användare	Främja produktdelning, till exempel genom delning av privatägda produkter eller genom offentlig delning av en pool av produkter.
	Återanvänd produkter under hela deras tekniska livstid	Stödja återanvändning av produkter, till exempel underlätta renoverings- eller renoveringsprocesser (t.ex. rengöring, demontering etc.) och tillhandahålla information om produktegenskaperna (t.ex. demonteringsprocess, använda material och komponenter, etc.).
	Förläng produkters livstid genom underhåll	Underlätta underhållet av produkterna genom att tillhandahålla underhållsinstruktioner till användare eller specialiserade tjänster (t.ex. krav på underhåll av beläggning, rekommenderade underhållsprodukter etc.).
	Förläng produkters livstid genom reparation	Underlätta produktreparation (av användaren eller av specialiserade tjänster), till exempel att tillhandahålla reparationsinformation, reservdelar och deras snabba leverans till rimligt pris, underlätta demontering / montering av produkter, öka garantiperioden eller tillhandahålla information om produktegenskaperna (t.ex. , begagnade material och komponenter etc.).
	Förläng produkters livstid genom design för hållbarhet	Förlänga produkters hållbarhet genom design, till exempel med mer hållbara material och beslag, undvika estetisk föråldring, tillämpa modulär / anpassningsbar design, etc.
Optimera	Öka produkters prestanda / effektivitet	Öka deras produkters prestanda, till exempel genom modulär design, använda ett lägre antal delar och material, erbjuda fler funktioner etc.
	Anpassning / gjord på beställning	Anpassa produkter efter konsumenternas behov och krav eller producera på begäran (t.ex. satsstorlek 1, massiv anpassning).
	Reproducerbar och anpassningsbar tillverkning	Uppgradering av tillverkningsprocesser så att de blir mer reproducerbara, anpassningsbara, flexibla och autonoma för att kräva förändringar och produktionsbehov (Industry 4.0).
	Minimera avfall i produktions- och leveranskedja	Minska produktionen av avfall under hela livscykeln för produkter, till exempel förpackningar (från leverantörer och produktdistribution), produktionsrester etc.
	Öka effektiviteten i produktionsprocesserna	Öka effektiviteten i deras produktionsprocess, till exempel genom att tillämpa ny 4.0-teknik (t.ex. robotar, big data, etc.), effektivare utrustning eller nya metoder (t.ex. mager tillverkning).
Loopa	Omtillverkning av produkter och / eller komponenter	Direkt omtillverkning av produkter eller delar, till exempel definiering av insamlingssystem, implementering av omtillverkningsprocesser (t.ex. sortering och rengöring, utbyte av komponenter / material etc.) och definiering av mekanismer för test- och kvalitetsvalidering.
	Implementera återtagningsprogram	Starta återtagningsprogram för företagets produkter (t.ex. insamlingsställen, omvänd logistik, behandlingsprocesser, scenarion för återvinning av uttjänta material, etc.)
	Återvinna material	Öka användningen av återvunna material (t.ex. träbaserat återvunnet material), definiera kvalitet och leveranskrav för återvunnet material, testprocedurer, mekanism för kvalitetsvalidering etc.
	Främja kaskadanvändning av trä	Stödja kaskadanvändning av trä, till exempel underlätta återvinning (materialkompatibilitet, etc.), undvika användning av farliga ämnen, tillhandahålla information om använda material och ämnen etc.
	Främja utvinning av biokemikalier från organiskt avfall	Att främja anaerob nedbrytning eller utvinning av biokemikalier från träavfall, till exempel undvika användning av möjliga föroreningar som underlättar återvinningsprocessen.
Virtualisera	Virtualisera direkta aspekter av produkten	Dematerialisera (virtualisera) själva produkten, till exempel genom den virtuella designen för kunden, simulering av produktprestanda etc.
	Virtualisera indirekta aspekter av produkten	Dematerialisera (virtualisera) indirekta aspekter av produkten, till exempel online-shopping, virtuella hjälptjänster, digital information om produkten för konsumenten etc.
Ersätt	Byt ut gamla material mot avancerade förnybara material	Ersätt gamla material med andra avancerade förnybara material, till exempel nya typer av laminat, nya beläggningar, nya tillsatser etc.
	Tillämpa ny teknik	Implementera och ta i bruk nya 4.0-teknologier i produkt- och produktionsprocesserna (t.ex. additiv tillverkning, IoT, förstärkt verklighet, etc.)
	Välja nya produkter och tjänster	Utveckla nya produkter, tjänster och affärsmodeller, till exempel servisering (produkt som tjänst), multifunktionell produkt, etc.

Effektnivå av de lagstiftande, frivilliga och politiska instrumenten på ReSOLVE-medlen

I följande tabell presenteras den förväntade inverkan av de identifierade lagstiftnings-, frivilliga- och politiska instrumenten på de föreslagna medlen i ReSOLVE-ramen för cirkulär ekonomi 2030.

0.- Ingen påverkan förutses 2030 på tillverkare av träbaserade möbler
1.- Liten påverkan förutses 2030 på tillverkare av träbaserade möbler
3.- Medelstor påverkan förutses 2030 på tillverkare av träbaserade möbler
5.- Stor påverkan förutses 2030 på tillverkare av träbaserade möbler

De högre värdena markerar de instrument som kan ha större inverkan på medlen och vilket medel som kan påverkas mer av dessa instrument. Denna information kan användas av företaget för att korrekt definiera sin egen cirkularitetsstrategi och dess anpassning till dessa instrument.

Tabell 5 - Effektnivå av de lagstiftande, frivilliga och politiska instrumenten på ReSOLVE-medlen

		Regenerera			
		Växla till förnybar energi	Växla till förnybara material	Återta, behåll och återskapa ekosystemens hälsa	Returnera återvunna biologiska resurser till biosfären
Lagstiftningsinstrument	EC:s paket för cirkulär ekonomi	3	5	3	3
	Direktiv om avfall från elektrisk och elektronisk utrustning (WEEE)	0	0	0	0
	Begränsning av farliga ämnen i elektrisk och elektronisk utrustning (ROHS)	0	0	0	0
	Direktivet om energirelaterade produkter (direktiv för ErP eller ekodesign)	0	3	1	0
	Utökat producentansvar (EPR-scheman)	3	3	1	3
	Farliga ämnen / REACH-förordningen	0	3	1	1
	Formaldehydutsläpp / VOCs	0	1	0	0
	EU-regler om "avfallskriterier för uttjänta produkter"	3	3	1	3
	Flamskyddsmedel	1	1	0	0
	Direktivet om förnybar energi (RED II)	5	0	0	3
	Olaglig avverkning och olaglig timmerhandel	0	3	3	0
Frivilliga instrument	Grön offentlig upphandling	1	5	1	0
	Miljöledning i organisationer	3	1	3	3
	Metod för ekodesign	3	5	0	1
	Miljömärkning (typ I, II och III)	1	3	1	0
	Spårbarhetscertifikat	0	5	5	1
	Grön byggcertifiering	1	3	1	0
Policyer	Kaskadanvändning av trä	3	5	1	3
	EU:s industripolitik för skogsbruk	1	3	3	1
	Plan för skogsbaserade industrier	1	3	1	1
	Bioekonomi	1	3	3	1
	Totalt	30	58	29	24

	Dela					Optimera					Loopa					Virtualisera		Ersätt			
	Minska ersättningshastigheten för produkter och öka produktanvändningen genom att dela den mellan olika användare	Återanvänd produkter under hela deras tekniska livstid	Förläng produkters livstid genom underhåll	Förläng produkters livstid genom reparation	Förläng produkters livstid genom design för hållbarhet	Öka produkters prestanda / effektivitet	Anpassning / gjord på beställning	Reproducerbar och anpassningsbar tillverkning	Minimera avfall i produktions- och leveranskedja	Öka effektiviteten i produktionsprocesserna	Omtillverkning av produkter och / eller komponenter	Implementera återtagningsprogram	Återvinna material	Främja kaskadanvändning av trä	Främja utvinning av biokemikalier från organiskt avfall	Virtualisera direkta aspekter av produkten	Virtualisera indirekta aspekter av produkten	Byt ut gamla material mot avancerade förnybara material	Tillämpa ny teknik	Välja nya produkter och tjänster	Totalt
	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	

GÅ TILL INDEX

Rangordning av påverkande ReSOLVE-medel och lagstiftning, frivilliga och politiska instrument

Följande två tabeller bygger på resultaten av den tidigare analysen.

Den första tabellen visar rangordningen av ReSOLVE-medel som påverkas mest av tidigare identifierade lagstiftning, frivilliga och politiska instrument som spelar en nyckelroll för att påskynda övergången för möbelbranschen mot en mer cirkulär ekonomi.

I den andra tabellen presenteras rangordningen av de instrument och policyer som mest påverkar ReSOLVE-medlen.

Tabell 6 - Rangordning av påverkan från ReSOLVE-medel

ReSOLVE-medel	Poäng
Återvinna material	68
Växla till förnybara material	58
Främja kaskadanvändning av trä	55
Välja nya produkter och tjänster	50
Tillämpa ny teknik	48
Öka effektiviteten i produktionsprocesserna	48
Förläng produkters livstid genom design för hållbarhet	43
Byt ut gamla material mot avancerade förnybara material	43
Återanvänd produkter under hela deras tekniska livstid	40
Reproducerbar och anpassningsbar tillverkning	40
Minimera avfall i produktions- och leveranskedja	38
Implementera återtagningsprogram	37
Omtillverkning av produkter och / eller komponenter	36
Virtualisera indirekta aspekter av produkten	36
Anpassning / gjord på beställning	33
Förläng produkters livstid genom reparation	32
Öka produkters prestanda / effektivitet	31
Växla till förnybar energi	30
Återta, behåll och återskapa ekosystemens hälsa	29
Returnera återvunna biologiska resurser till biosfären	24
Minska ersättningshastigheten för produkter och öka produktanvändningen genom att dela den mellan olika användare	21
Förläng produkters livstid genom underhåll	21
Virtualisera direkta aspekter av produkten	20
Främja utvinning av biokemikalier från organiskt avfall	18

Tabell 7 - Rangordning av påverkan från instrument och policyeffekter för cirkulär ekonomi

Instrument	Poäng
EC:s paket för cirkulär ekonomi	84
Utökat producentansvar (EPR-scheman)	78
Grön offentlig upphandling	74
Metod för ekodesign	64
Kaskadanvändning av trä	60
Plan för skogsbaserade industrier	59
Miljömärkning (typ I, II och III)	54
Spårbarhetscertifikat	43
Farliga ämnen / REACH-förordningen	42
Miljöledning i organisationer	37
Direktivet om energirelaterade produkter (direktiv för ErP eller ekodesign)	37
Flamskyddsmedel	35
Bioekonomi	35
Grön byggcertifiering	34
EU-regler om "avfallskriterier för uttjänta produkter"	34
Olaglig avverkning och olaglig timmerhandel	26
Formaldehydutsläpp / VOCs	26
Direktiv om avfall från elektrisk och elektronisk utrustning (WEEE)	24
Direktivet om förnybar energi (RED II)	21
EU:s industripolitik för skogsbruk	20
Begränsning av farliga ämnen i elektrisk och elektronisk utrustning (ROHS)	12

Risker och faror inom trämöbelindustrin

Träbearbetning inom möbelindustrin kan vara farligt för arbetstagare. Från användning av maskiner och verktyg, hantering av tunga material till exponering för damm, buller och kemikalier - potentiellt skadliga händelser kan inträffa när som helst. Dessa händelser kan påverka arbetstagarnas hälsa, till exempel orsaka dem att drabbas av hudsjukdomar och respiratoriska sjukdomar. De kan orsaka skador som förlust av fingrar eller till och med dödsfall.

I tabell 8 hittar du en översikt över de olika typerna av faror som arbetstagare inom tillverkningsindustrin för trämöbler kan utsättas för. Det är skapat av vår arbetsmiljöexpert, baserad på olika informationskällor och deras analys. I BLÅTT visas farorna på grund av sektorns digitalisering år 2025. Utöver detta visas i GRÖNT de nya riskerna på grund av övergången till cirkulär ekonomi 2030.

De faror som nämns i tabellen är relaterade till möbelindustrin - möbeltillverkningsanläggningar - och de potentiella nya aktiviteter som kan genomföras i dessa anläggningar på grund av nya produktionsprocesser och affärsmodeller som uppstår på grund av en mer cirkulär ekonomi (t.ex. omtillverkning, reparation , etc.).

Förutsatt att arbetshälsa och säkerhet är en del av hanteringen och ingår i utformningen av miljövänliga produkter (t.ex. enklare demontering, mindre farliga ämnen, etc.), kommer hälsa och säkerhet för arbetstagare inom träbearbetningssektorn att dra nytta av strategier för cirkulär ekonomi.

Förändringar och faror på grund av aktiviteter och uppgifter inom återvinningsindustrin eller relaterade till nya energikällor omfattas inte av denna analys och har inte inkluderats. Fälttjänster som underhåll och reparation hos kunder omfattas inte heller av denna rapport.

Tabell 8 - Vanliga och nya risker och faror inom möbelbranschen.

Olika riskkategorier	Riskdetaljer för varje kategori och kort beskrivning
Mekaniska faror	
• Oskyddade rörliga delar (cobotics), (klämma, stöta, krossa, skära, amputera, dra in/fånga). • Delar med farliga former (skärande, spetsiga, grova). • Rörliga transportmedel och verktyg (överkörning, välta, fall från höjd). • Okontrollerade rörliga delar (flygande föremål, träflis).	Hand- och elverktyg: Risk för stickningar, skärningar, amputationer av fingrar från hand- och elverktyg. Omtillverkning och selektiv demontering kan kräva nya typer av verktyg. Oskyddade rörliga delar: Risk för att kroppsdelar fastnar i roterande delar eller maskiner. Delar med farliga former (skärande, spetsiga, grova).
• Halkning och snubbling	Halkning, snubbling och fall från höjder.
• Fall från höjder	Risk för halkning och snubbling från hala ytor, trappor, hinder på gångvägar, dålig belysning, olämpliga skor, osäker användning av stegar.
• Ergonomiska risker	Riskerna med ergonomiska faror kan minska beroende på cobotars/robotars övertagande av specifika uppgifter. Å andra sidan utsätts arbetstagarna alltmer för ergonomiska faror som brist på motion / inaktivitet på grund av att man använder autonoma maskiner och cobotar från datorarbetsstationer. Risken kan minska för arbetstagare genom bättre design av produkter (ekodesign), med tanke på aspekter som enklare montering och demontering, bättre urval av anslutningssystem etc. och om säkert underhåll av maskiner beaktas från början.
• Tunga belastningar / tungt dynamiskt arbete	Risk för smärta vid tunga belastningar och tungt dynamiskt arbete. Risken kan minska för arbetstagare på grund av användning av robotar / cobotar och digitala maskiner. Demontering av tillverkade varor kan orsaka muskuloskeletala störningar (MSD) (t.ex. besvärliga positioner, tunga lyft och tungt bärande).
• Besvärlig position / obalanserad belastning	Risk för smärta eller skada genom att arbeta i besvärliga positioner. Risken kan minska för arbetstagare på grund av användning av robotar / cobotar och digitala maskiner. Demontering för materialåtervinning (destruktiva metoder) kan orsaka ytterligare muskuloskeletala störningar (MSD).
• Repetitiva rörelser	Risk för smärta eller skada genom att utföra repetitiva uppgifter.
• Brist på motion; inaktivitet	Risk för kronisk nack- och ryggsmärta, fetma och hjärt-kärlsjukdomar till följd av inaktivitet, långvarigt sittande och dålig ergonomisk praxis med mobila enheter.
Elektriska faror	
• Elstöt	Risk för elstöt från dåligt underhållna eller trasiga maskiner och elektriska kablar.
• Faror på grund av fysiska effekter / fysiska agenser	
Faror på grund av fysiska effekter / fysiska agenser	
• Buller	Exponering för högt ljud från maskiner och verktyg. Möjlig mer användning av högljudda maskiner vid demontering och reparation. Dock kan buller minskas på grund av ekodesign för maskiner som fungerar tystare och mer effektivt.
• Vibration	Risk för hand- och armvibrationer från vibrerande verktyg eller arbetsstycken. Möjlig ytterligare användning av vibrerande verktyg under produktrenovering eller reparation (putsare, etc.). Dock kan vibrationer minskas på grund av ekodesign för maskiner som fungerar tystare och mer effektivt.
• Laserljus	Exponering för laserljus från laserskärmaskiner.
Brand- och explosionsrisker	
• Brandfarliga ämnen	Explosion: Explosionsrisker från material, inklusive trädamm och kemikalier. Återvinning av träprodukter ger höga nivåer av trädamm och små partiklar under krossningen. Utan effektivt dammutsug kan explosionsrisken öka. Lösningsmedel, rengöringsprodukter och smörjmedel som används inom träbearbetningssektorn kan baseras på mindre farliga ämnen (t.ex. lösningsmedel) och därför förhindra brandrisker.
	Brand: Brandrisk från kemikalier och trädamm. Återvinning av träprodukter ger höga nivåer av trädamm och små partiklar under krossningen. Utan effektivt dammutsug kan brandrisken öka. Lösningsmedel, rengöringsprodukter och smörjmedel som används inom träbearbetningssektorn kan baseras på mindre farliga ämnen (t.ex. lösningsmedel) och därför förhindra brandrisker.
Arbetsmiljörisker	

Olika riskkategorier	Riskdetaljer för varje kategori och kort beskrivning
Dåliga ljusförhållanden	Risk för bländning eller otillräckligt ljus samt flimrande ljus.
Klimat	Risk för att utsättas för varm eller kall arbetsmiljö i kombination med fukt eller drag.
Dålig ventilation	Risk för att utsättas för en arbetsmiljö med dålig ventilation eller utan frisk luft.
Faror genom farliga ämnen	Risken kan minska för arbetstagare på grund av användning av robotar / cobotar och digitala maskiner vid hantering av farliga ämnen. Tillverkning: Faror kan minskas om hänsyn till arbetsmiljö ingår i utformningen av produkterna / materialen. Behovet av lösningsmedel kan minska, mindre farliga lösningsmedel kan användas, och även användningen av farliga flamskyddsmedel om någon ny relaterad lagstiftning godkänns eller god praxis implementeras. Återvinning / användning av återvunnet material: Farorna kan ökas av bristen på information om kemikalier i återvunna produkter och om hur man hanterar dem på lämpligt sätt.
• Damm	Cancerrisk från trädamm. Risk för allergiska luftvägssymptom från trädamm. Återvinning - Ökad exponering för damm: exponering för fibrer eller damm vid demontering, omtillverkning och reparation av möbler; damm från återvunnet material av okänt ursprung kan orsaka yrkesastma (fall av yrkesastma har rapporterats i samband med trä- och pappersåtervinning).
• Lösningsmedel (neurotoxiska, allergener)	Risker från farliga kemikalier, lösningsmedel och andra material - dermatit, allergiska reaktioner eller andningsbesvär, organskador. Tillverkning: behovet av lösningsmedel kan minska, mindre farliga lösningsmedel kan användas. Reparation och återtillverkning kan öka behovet av lösningsmedel (rengöring av lack, rengöring av begagnade delar).
• Carcinogena ämnen	Cancerrisker från kemikalier (farliga flamskyddsmedel huvudsakligen i klädselprodukter; lim och beläggningsmedel används vid efterbehandling av träprodukter, som lösningsmedel i färger, lim, lack och kemikalier för färgborttagning) Tillverkning: behovet av lösningsmedel kan minska, mindre farliga lösningsmedel kan användas. Återvinning och användning av återvunnet material: Återvunnet material kan innehålla farliga ämnen, enligt de senaste resultaten cancerframkallande eller reproduktionstoxiska (numera begränsade av lag (REACH)).
• Nya material (t.ex. nanomaterial)	Risk för exponering för nanomaterial: det finns stora luckor i kunskapen om hälsorisker som är förknippade med nanomaterial. Å andra sidan kan nya material vara säkrare ersättare för farliga ämnen.
• Återvunna material	Återvunna material kan koncentrera farliga ämnen (föroreningar och farliga flamskyddsmedel främst i klädselprodukter) under successiv återvinning eller kan ändra sammansättningen på grund av olika faktorer som ljus, värme och åldrande av material -okänt innehåll och typ av farliga ämnen.
Biologiska faror	
• Hantering av mikroorganismer: Risker från icke-riktade aktiviteter med mikroorganismer.	Nya företag som använder sitt eget träavfall som energikälla. Renoveringsaktiviteter och återtagningssystem av gamla möbler kan riskera att arbetare utsätts för mikroorganismer som mögel.
Psykosociala faror	Arbetsmiljön och själva arbetets karaktär har båda viktig påverkan på arbetstagarnas hälsa och välbefinnande.
• För hög arbetsbelastning	För hög arbetsbelastning riskerar att utsätta arbetstagare för stor tidspress och arbete som går över gränsen.
• Låg arbetstillfredsställelse	Låg arbetstillfredsställelse leder till psykisk ohälsa för arbetstagare och kan leda till sömnstörningar, huvudvärk och mag-tarmproblem.
• Otydligt definierade arbetsuppgifter	Dålig organisation av arbetet, uppgifter som inte är klart definierade kan medföra risk för arbetstagare med överbelastning eller belastning och resultera i missnöje och stress.
• Dålig organisation av arbetet	Dålig organisation av arbetet kan medföra risk för arbetstagare med överbelastning eller belastning, maskintakt, hög tidspress.
• Dåligt utformad arbetsmiljö (inkl. programvara)	Otillräcklig tillgänglighet, lämplighet eller underhåll av utrustning; dåliga miljöförhållanden som brist på utrymme, dålig belysning, alltför stort buller, sätter arbetarna under stress.
• Repetitivt, monotont arbete	
• Kognitiv ansträngning	Kognitiva interaktioner med autonom utrustning och virtuell verklighet sätter arbetstagare under stress. Ökad efterfrågan på kompetens och aktuell kunskap om utvecklingen inom cirkulär ekonomi och återvinningsindustri.
• Stress på grund av långvarig koncentration och uppmärksamhet	Långa perioder av koncentration med att arbeta med datorer och ny programvara och att utföra många uppgifter samtidigt.

Olika riskkategorier	Riskdetaljer för varje kategori och kort beskrivning
• Ökade krav på flexibilitet	Ökade krav på flexibilitet: arbetstagare kan utföra vissa uppgifter överallt med mobila enheter. Arbetare riskerar att vara permanent tillgängliga utanför arbetstid. Renoverings- och reparationsaktiviteter, arbete med återvunnet material, beslut om cirkulära ekonomiska och hållbara strategier / produkter / marknadsföringsprojekt och användning av förnybara energikällor kräver ett ökat krav på flexibilitet.
• Brist på arbetserfarenhet	Ny programvara och digitala enheter kräver utbildning, vissa arbetare kanske inte har tillräcklig kompetens och kan känna sig överbelastade, inte tillräckligt erfarna. Arbeta med material som tidigare har tillverkats: nya färdigheter måste förvärvas genom hela produktionscykeln och leveranskedjan. Reparation, omtillverkning och selektiv demontering kräver nya metoder och procedurer. Beslut om cirkulära ekonomiska och hållbara strategier / produkter / marknadsföringsprojekt.
• Brist på delaktighet i att fatta beslut som påverkar arbetstagaren	Arbetare som inte ser sig respekterade och uppskattade känner sig sårbara och hjälplösa.
• Ineffektiv kommunikation, brist på stöd från ledningen eller kollegor	Ineffektiv kommunikation på grund av dålig arbetsmiljö eller brist på kollegor sätter arbetare under stress.
• Arbeta ensam / isolering	Att arbeta ensam utan kollegor eller bara med robotar sätter arbetare under stress och isolering.
• Obalanserad arbetsbelastning: överbelastning / underbelastning	Obalanserad arbetsbelastning sätter arbetare under stress.

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.

Kort beskrivning av färdigheter, kunskaper och kompetenser och de gröna allmänna kompetenserna

Definitionerna av följande begrepp är desamma i ESCO (europeisk klassificering av färdigheter, kvalifikationer och yrken) och i den europeiska kvalifikationsramen.

Kunskap

"Kunskap innebär resultatet av tillgodogörande av information genom lärande. Kunskap är de fakta, principer, teorier och metoder som är relaterade till ett arbets- eller studiefält."

Både färdigheter och kompetens är beroende av faktiska och teoretiska kunskaper, skillnaden ligger i hur denna kunskap tillämpas och tas i bruk.

Färdigheter

"Färdighet betyder förmågan att tillämpa kunskap och använda sakkunskap för att slutföra uppgifter och lösa problem". De kan beskrivas som kognitiva (involverar användning av logiskt, intuitivt och kreativt tänkande) eller praktiska (involverar manuell skicklighet och användning av metoder, material, verktyg och instrument).

Kompetens

"Kompetens betyder den beprövade förmågan och den individuella förmågan att använda kunskap (teoretisk och praktisk), färdigheter och personliga, sociala och / eller metodiska förmågor, i verkliga arbets- eller studiesituationer och i professionell och personlig utveckling." De beskrivs i termer av ansvar och autonomi. Kompetenser är därför per definition individuella, processorienterade (handlings- och utvecklingsorienterade) och kontextuella.

Även om de ibland används som synonymer kan termerna färdighet och kompetens särskiljas utifrån deras omfattning. Termen färdighet hänvisar vanligtvis till användning av metoder eller instrument i en viss miljö och i relation till definierade uppgifter. Begreppet kompetens är bredare och hänvisar typiskt till en persons förmåga - att möta nya situationer och oförutsedda utmaningar - att använda och tillämpa kunskap och färdigheter på ett självständigt och självstyrt sätt.

Därmed:

- **Kunskap = teoretisk, praktisk, yrkesmässig, industriell ...**
- **Färdigheter = kognitiva, praktiska, sociala ... Färdigheter = sakkunskap ...**
- **Kompetens = uppgiftsbaserad, yrkesmässig, procedurell, social, personlig ... Kompetens = social kompetens och självkompetens**

Generiska gröna färdigheter

Generiska gröna färdigheter inkluderar kunskap, färdigheter och kompetenser (KSC) som är nödvändiga för social, ekonomisk och miljömässig utveckling i vår trämöbelsektor. Tack vare dessa generiska gröna färdigheter kan vi bidra till en grönare sektor och stödja omvandlingen från en linjär till en cirkulär ekonomi. Därför är det nödvändigt att utveckla ett grönt tänkesätt för att minimera miljöpåverkan under hela produkternas livscykel.

Dr Margarita Pavlova har klassificerat **generiska gröna färdigheter i fyra kategorier**, som krävs för varje yrke oavsett kompetensnivå och åtföljer nyckelkompetenser eller mjuka färdigheter som är avgörande för den moderna arbetskraften. Dessa mjuka färdigheter kontextualiseras här i perspektivet av miljömedvetenhet och förståelsen för hållbar utveckling och cirkulär ekonomi.

- **kognitiva kompetenser** (1 till 3)
- **interpersonella kompetenser** (4 till 9)
- **intrapersonella kompetenser** (10 till 11)
- **teknologiska kompetenser** (12 till 14)

I denna SAWYER-studie använder vi dessa generiska gröna färdigheter i följande sammanhang:

- **Miljömedvetenhet och vilja att lära sig** om hållbar utveckling och cirkulär ekonomi.
- **System- och riskanalysfärdigheter** för att bedöma, tolka och förstå både behovet av förändring från en linjär till en cirkulär ekonomi och de specifika åtgärder som krävs för denna omvandling.
- **Innovationsförmågor** för att identifiera möjligheter och skapa nya strategier för att svara på gröna utmaningar i samband med cirkulär ekonomi.
- **Koordinerings-, lednings- och affärsfärdigheter** för att underlätta holistiska och tvärvetenskapliga tillvägagångssätt som innefattar ekonomiska, sociala och ekologiska mål i organisationen, men också i produktvärdekedjan.
- **Kommunikations- och förhandlingsförmågor** för att diskutera motstridiga intressen i komplexa sammanhang associerade med produktens värdekedja.
- **Marknadsföringsfärdigheter** för att marknadsföra grönare produkter och tjänster och kommunicera fördelarna med strategier för cirkulär ekonomi.
- **Strategiska och ledande färdigheter** som gör det möjligt för beslutsfattare och företagsledare att sätta rätt incitament och skapa förutsättningar som möjliggör renare produktion, renare transporter etc. och främjar cirkulär ekonomi i allmänhet.
- **Konsultfärdigheter** för att ge konsumenter råd om gröna lösningar och sprida användningen av grön teknik och strategier för cirkulär ekonomi.
- **Färdigheter inom nätverk, informationsteknik och språk** för att möjliggöra prestanda på globala marknader och i produktvärdekedjan.
- **Anpassnings- och överföringsförmågor** för att göra det möjligt för arbetstagare att lära sig och tillämpa de nya tekniker och processer som krävs för att miljöanpassa sina jobb och tillämpa strategier för cirkulär ekonomi.
- **Entreprenörsfärdigheter** för att fånga upp möjligheterna med koldioxidsnål teknik och cirkulära affärsmodeller för produkter och tjänster.
- **Kvantifiering och bevakning** av avfall, energi och vatten för att följa utvecklingen av indikatorer för cirkulär ekonomi.
- **Materialanvändning och effektkvantifiering** och bevakning vid grön upphandling och urval,
- **Minimering** av materialanvändning och påverkan (konsekvensbedömning) med hänsyn till materialets hela livscykel

Vi har angett om dessa generiska gröna färdigheter har en inverkan (eller inte) på de riktade ESCO-profilerna och i vilken åtgärd.

Tekniska gröna färdigheter

För vissa yrkesprofiler krävs nya gröna färdigheter, eftersom det kommer att finnas vissa nya, specifika uppgifter relaterade till demontering och återanvändning, omtillverkning, återvinning och upcycling. Dessa nya färdighetsuppsättningar är särskilt (mer) viktiga för de "praktiska" profilerna, till exempel möbelsnickaren, tapetseraren eller trämaskinställaren, men också för fabriksarbetaren, möbelmonteraren och sågverksoperatören. För dessa profiler är några av de generiska gröna färdigheterna som är relaterade till ledning, marknadsföring och kommunikation mindre uttalade.

De **nya specifika, tekniska gröna färdigheterna** är:

- Demontera träbaserade möbelprodukter.
- Undersök demonterade bitar för ytterligare steg (återanvändning, omtillverkning, återvinning, upcycling).
- Reparera träbaserade möbler där det behövs.

Dessa färdigheter kommer som en "påfyllning" av de befintliga, nödvändiga KSC:erna för ovan nämnda yrkesprofiler.

De nya gröna färdigheter kommer också att ha en inverkan, men inte lika signifikant, på de profiler som hanterar och fattar strategiska beslut inom företaget. När det gäller de analyserade ESCO-profilerna tänker vi på försäljnings- och marknadsföringschefer, chefer inom tillverkning, SCM-chefer och naturligtvis möbeldesignerna.

Yrkesprofiler: nuvarande och prognostiserade förändringar till 2030

Följande avsnitt innehåller detaljer om de förändringar som prognostiserats inom **möbelsektorn** på grund av dess cirkulära ekonomiövergång (i grönt 2030) och digitalisering (i blått 2025): de **uppdaterade uppgifterna** för de utvalda yrkesprofilerna, de **befintliga och nya arbetsmiljöriskerna** och de **uppdaterade färdighets-, kunskaps- och kompetensbehoven**. De presenteras genom specifika tabeller med fokus på var och en av dessa aspekter.

I alla följande tabeller använde vi blå textfärg för att identifiera eventuella förändringar av den aktuella situationen på grund av sektorns digitalisering och grön textfärg för förändringarna på grund av sektorns cirkulära ekonomiövergång.

Förändrade uppgifter

Nuvarande och prognostiserade uppgifter förändras på grund av sektorns övergång till cirkulär ekonomi och digitalisering för varje yrkesprofil.
I dessa gröna tabeller innehåller den **första kolumnen** till vänster en detaljerad beskrivning för varje profil av de **aktuella / uppdaterade uppgifterna** (2020). Kolumnerna och cellerna i mitten identifierar vilka uppgifter som påverkas av de olika ReSOLVE-medlen. Den **sista kolumnen till höger** presenterar **prognoserna för uppgiftsförändringar** på grund av sektorns digitalisering i blått för 2025 och på grund av sektorns övergång till cirkulär ekonomi i grönt 2030.

Förändringar i faror och risker

Nuvarande och prognostiserade risker förändras på grund av sektorns digitalisering för varje yrkesprofil.
I dessa gula tabeller är de första och de sista kolumnerna desamma som i tidigare tabeller över uppgiftsförändringar. De centrala cellerna representerar prognosen för den **nya kategoriseringen av faror**, och identifierar i grått de som inte borde förändras, i grönt de som är reducerade på grund av cirkulär ekonomi, i rött de nya eller ökade på grund av cirkulär ekonomi, i blått de som minskar på grund av digitalisering och i gult de som ökar på grund av digitalisering. Efter denna tabell innehåller ett annat avsnitt **detaljer om aktuella och prognostiserade faror och riskförändringar** på grund av sektorns övergång till cirkulär ekonomi (i grönt för 2030) och digitalisering (i blått för 2025).

Behov för färdigheter och kompetenser

Prognos för att utbilda nya behov på grund av sektorns övergång till cirkulär ekonomi (i grönt 2030) och sektorns digitalisering (i blått 2025) för varje yrkesprofil.

I dessa tabeller, i den vänstra kolumnen, finns en lista över **nuvarande och nya färdighets-, kunskaps- och kompetensbehov** inklusive de generiska gröna. Den andra kolumnen berättar för varje profil om SKC kommer att uppdateras (JA, ändras), fortfarande behövas (JA eller NEJ), nya (NY) eller inte tillämpligt (NA). I de sista kolumnerna till höger, vars antal och innehåll skiljer sig åt för varje profil, identifieras **orsakerna till förändring** för varje kompetens, kunskap och kompetens: de gröna punkterna indikerar att förändringen beror på sektorns övergång till cirkulär ekonomi och de blåa punkterna om det beror på sektorns digitalisering.

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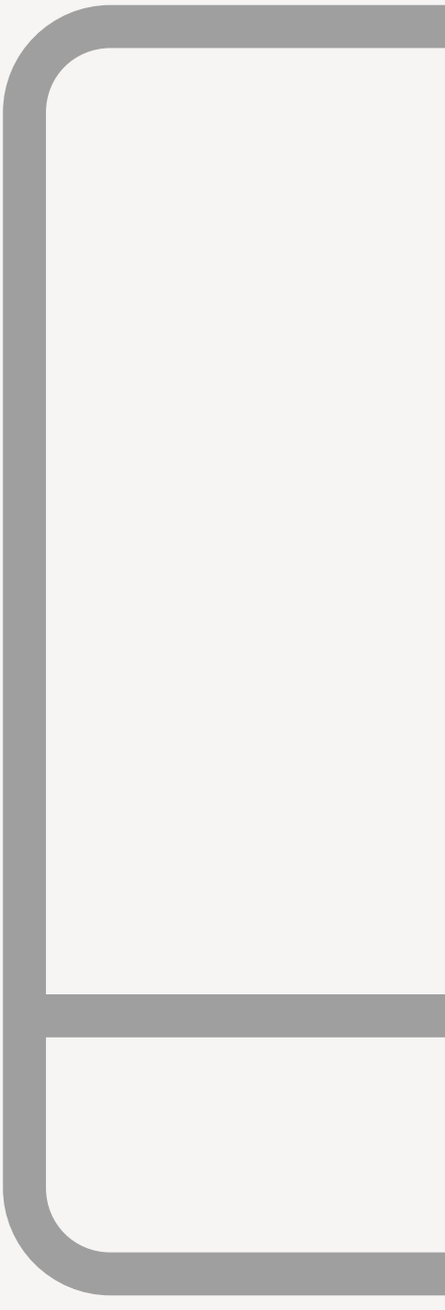

Sales and marketing manager ISCO 1221

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

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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.

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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		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	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.

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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: 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

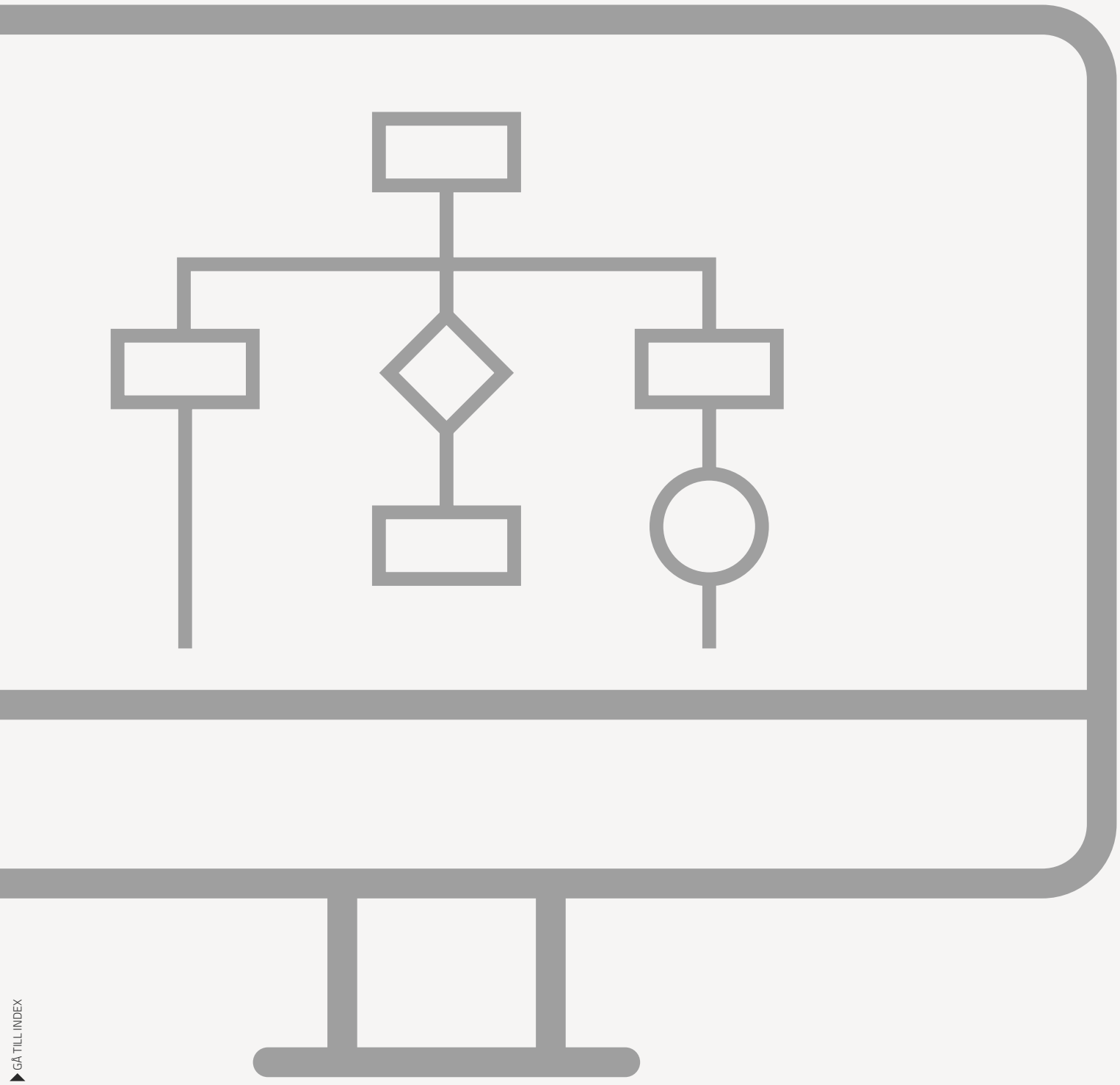
Industrial production manager ISCO 1321s

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

▲ GÅ TILL INDEX

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.

GÅ TILL INDEX

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. **Effects:** squeezing, cutting, twisting, spraining, bumps and bruises.	• 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.
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 machines 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, 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. **Effects**: stress: burnout and emotional distress, suffering from depression, cardiovascular problems, sleep disorders.	• 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, 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

GÅ TILL INDEX

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	
		ReSOLVE levers*																							
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.

GÅ TILL INDEX

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.

GÅ TILL INDEX

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.	• 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 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 equipment 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.	• 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

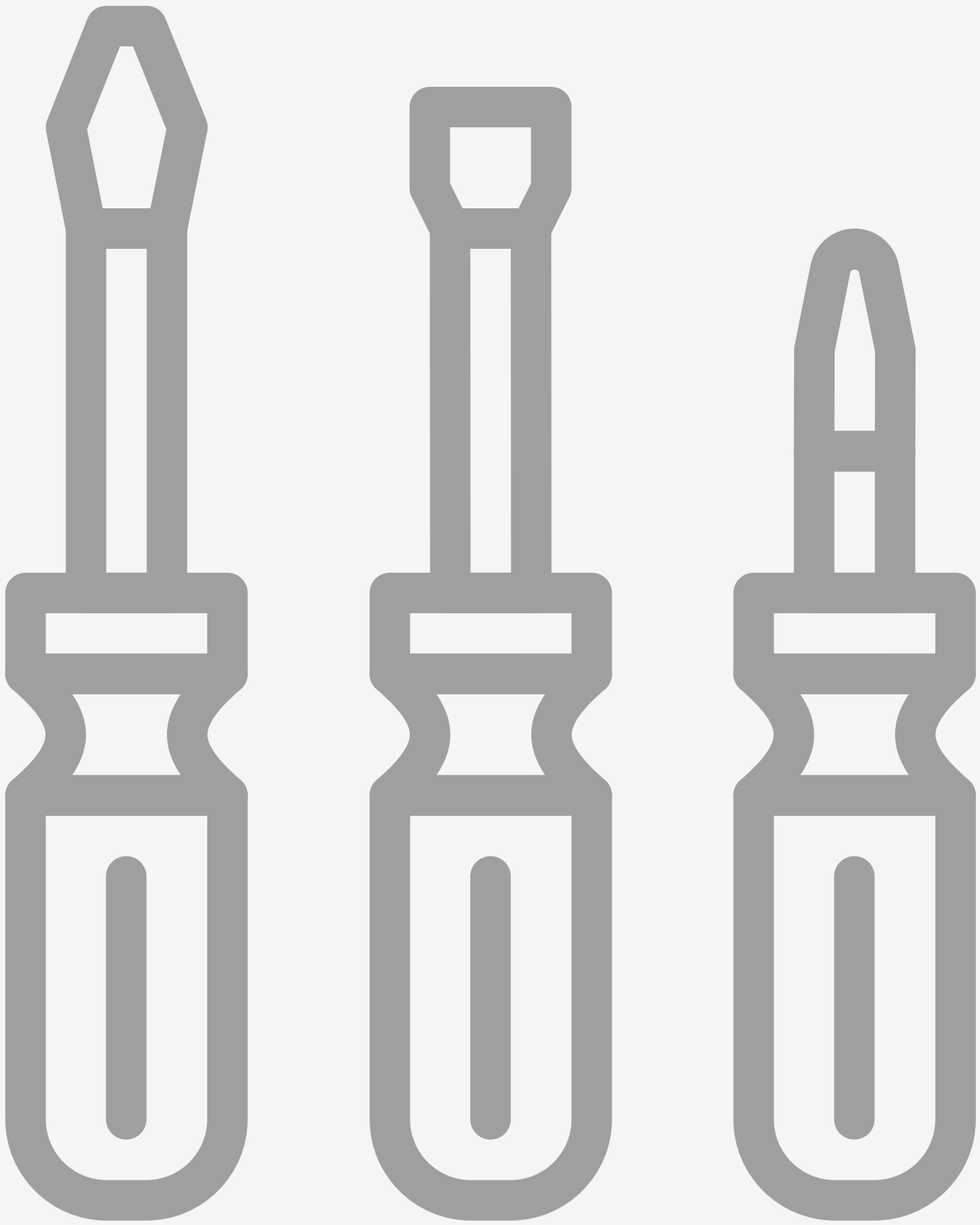
Maintenance & repair engineer ISCO 2141s

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

▲ GÅ TILL INDEX

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 purchasing, storing and controlling departments to ensure a steady flow of sustainable supplies within and around the entire digital ecosystem and following green purchasing criteria.

GÅ TILL INDEX

Maintenance & repair engineer ISCO 2141s

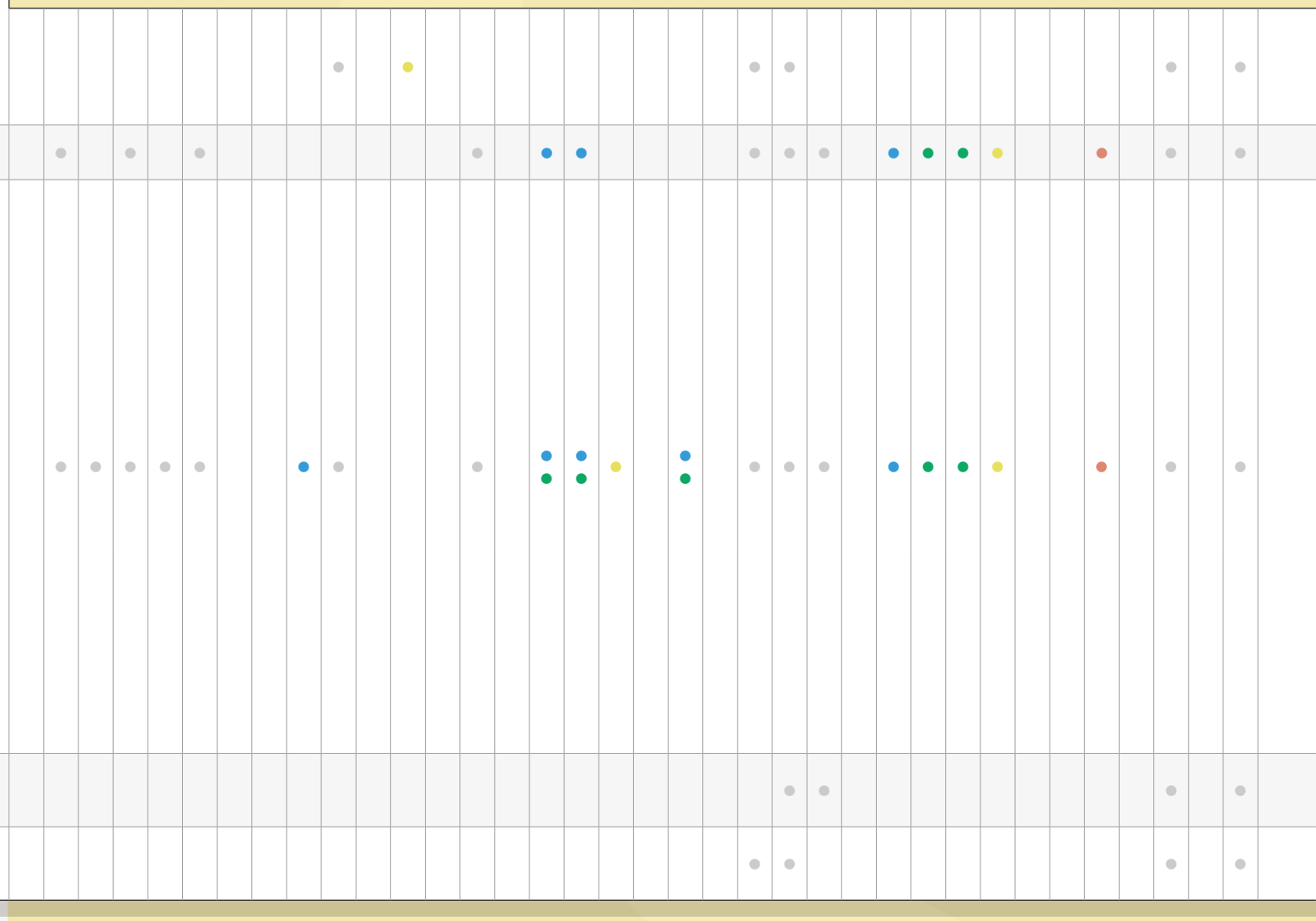
2020
Occupational profile

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
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.

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



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 purchasing, 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.

GÅ TILL INDEX

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

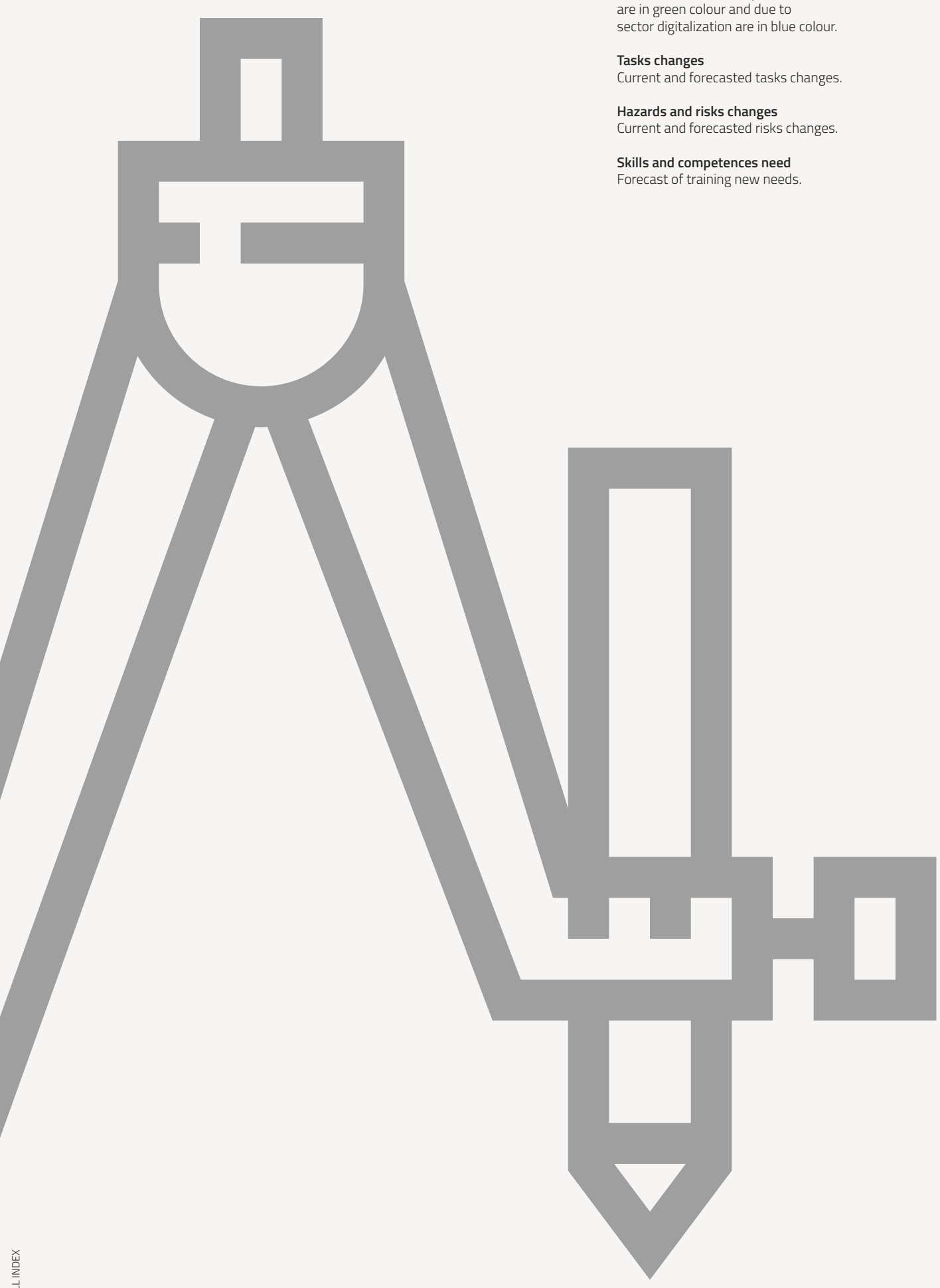
Furniture designer
ISCO 2163s

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

GÅ TILL INDEX

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 impact, for example energy consumption or waste generation.

GÅ TILL INDEX

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.	• Mechanical hazards: (when working in workshops to prepare prototypes): from moving machines and tools.
Effects: bruises, cuts and sharp injuries, crushing.	**Effects**: bruises, 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 and inactivity, prolonged sitting and from poor ergonomic practices with mobile devices.	• 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.	**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.	• Electrical hazards: contacts with live parts or connections or exposure to arc flash.
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.
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

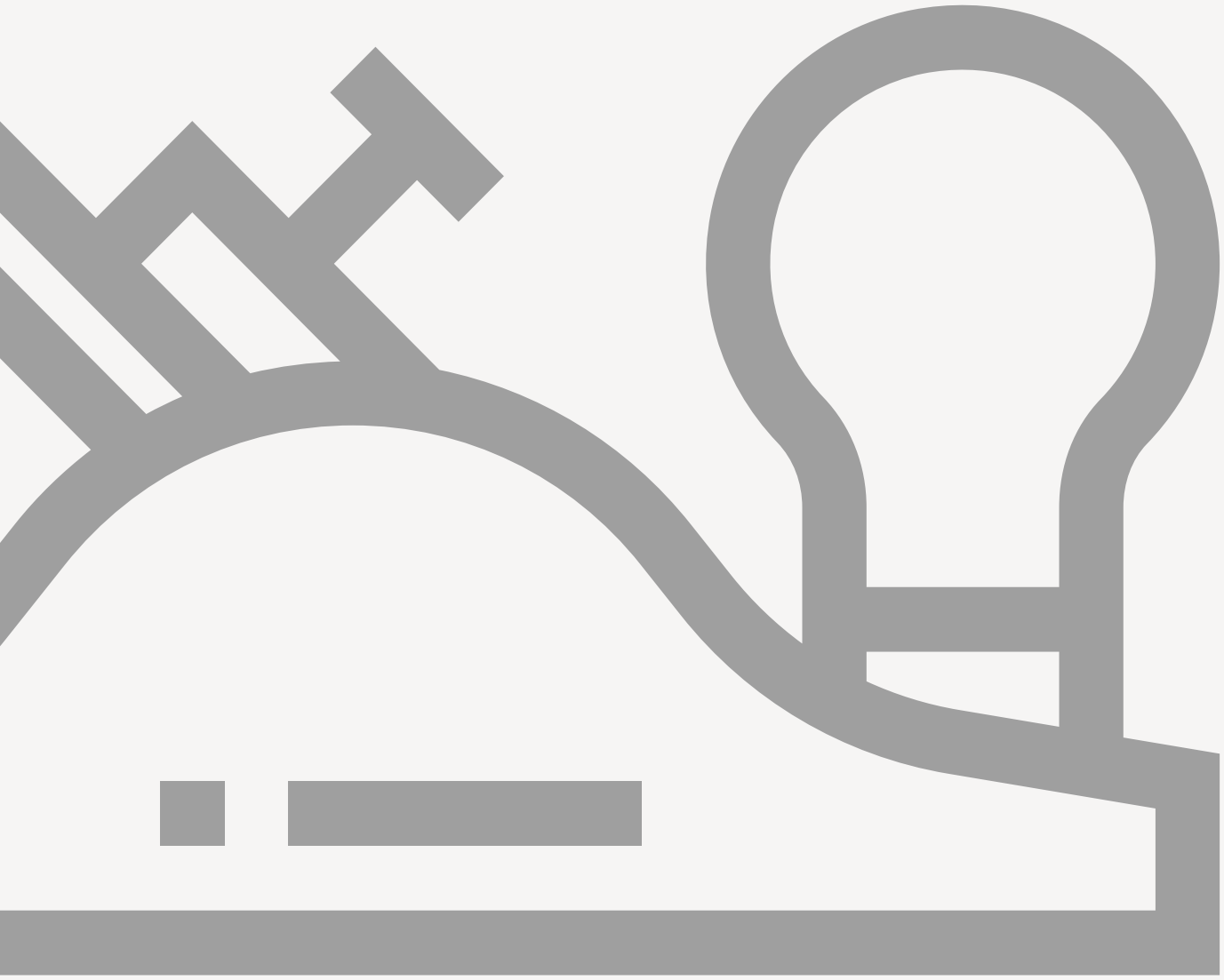
Cabinet-maker and related workers
ISCO 7522

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

GÅ TILL INDEX

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.

GÅ TILL INDEX

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

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. **Effects**: negative effects on muscles, tendons and joints, cold, poor concentration, eye strain, headache.	• 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.
Hazards through dangerous substances	
• Chemical hazards/ dangerous substances: asbestos, glass fibre, vapours, fumes, dust, solvents, new materials (nanomaterials). **Effects**: contamination/intoxication, skin diseases, respiratory diseases, cancer.	• 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. • 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. **Effects**: contamination/intoxication, skin diseases, respiratory diseases, infections.	• 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.
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. **Effects**: stress, burnout and emotional distress, suffering from depression, cardiovascular problems, sleep disorders.	• 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.

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

GÅ TILL INDEX

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 woodworking 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.

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 woodworking 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/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, 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

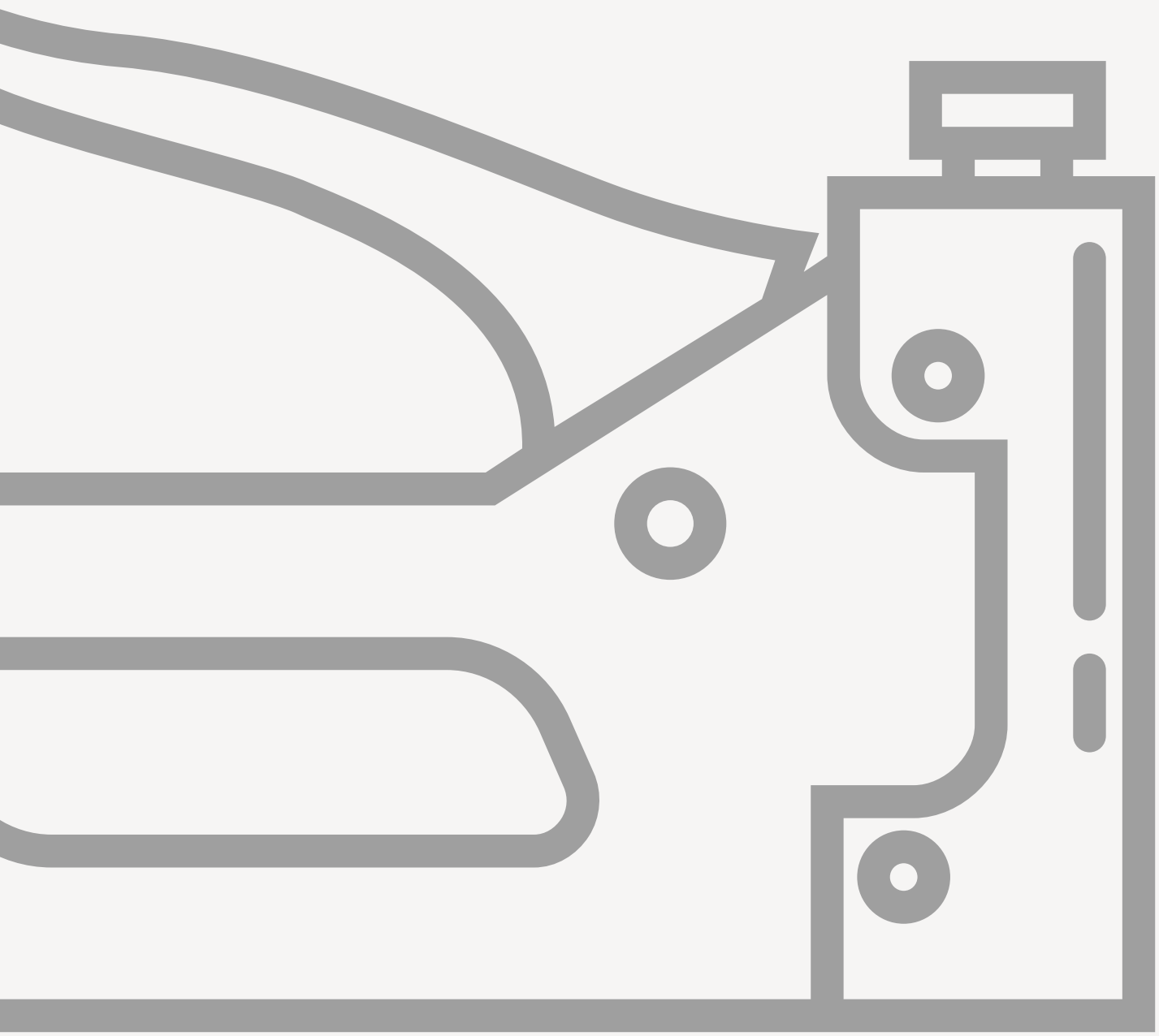
Upholsterer and related workers
ISCO 7534

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
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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

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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.

ReSOLVE levers*

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	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. **Effect**: negative effects on muscles, tendons and joints, cold, poor concentration, eye strain.	• Work environmental hazards: poor lighting, inadequate temperature and climate, poor ventilation. **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. **Effects**: contamination/intoxication, skin diseases, respiratory diseases, allergies, cancer.	• 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.
	• 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 ~~u~~nknown 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. **Effects**: contamination/intoxication, skin diseases, respiratory diseases, infections.	• 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.
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. **Effects**: stress, burnout and emotional distress, suffering from depression, cardiovascular problems, sleep disorders.	• 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.

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

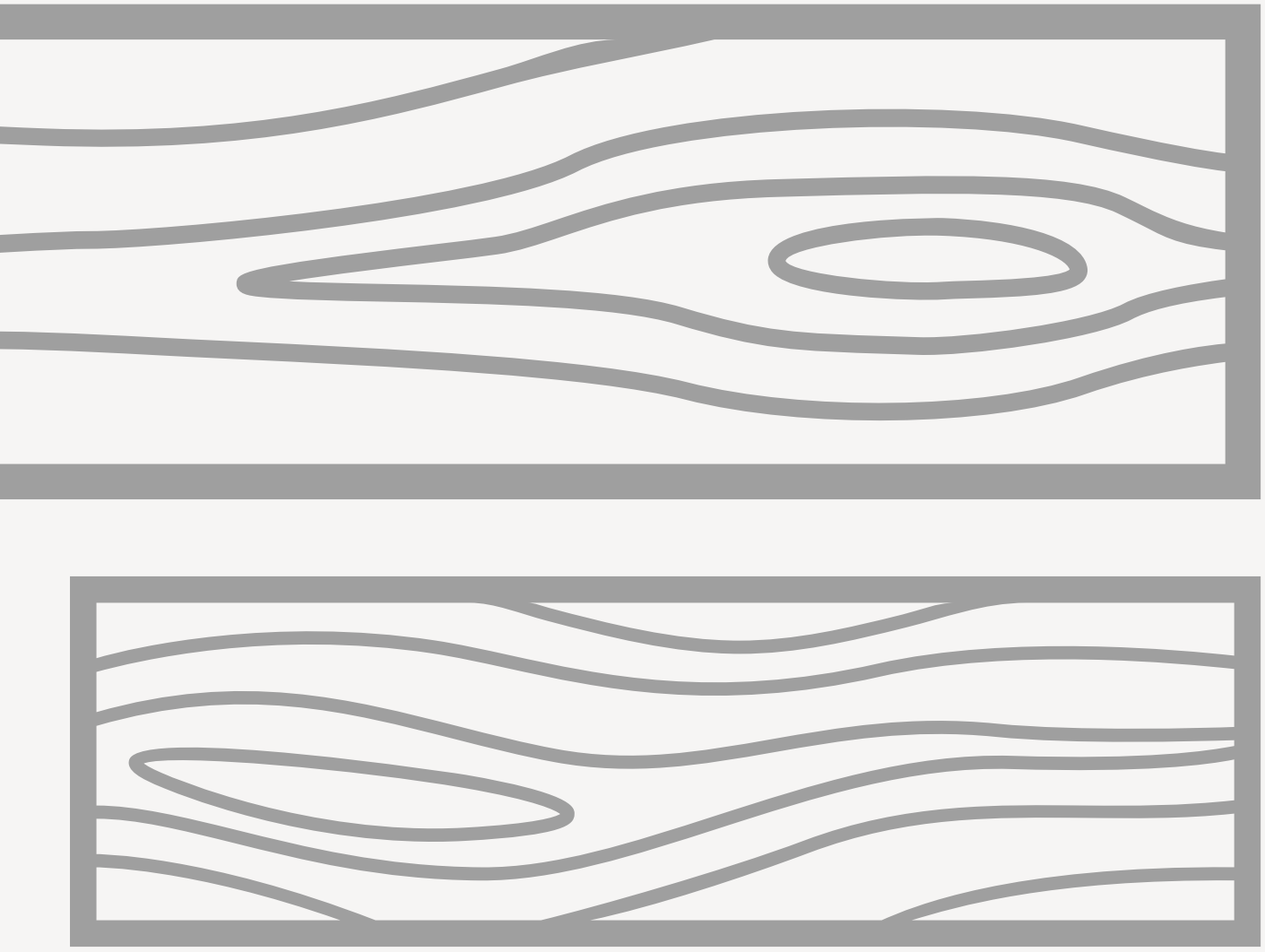
Wood processing plant operator
ISCO 8172

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.



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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

GÅ TILL INDEX

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.

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	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

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	
	●	●		●	●	●	●		●	●	●	A
	●	●		●	●	●	●		●	●	●	B
	●	●		●	●	●	●		●	●	●	C
	●	●		●	●	●	●		●	●	●	D
	●	●		●	●	●	●		●	●	●	E
	●	●		●	●	●	●		●	●	●	F
	●	●		●	●	●	●		●	●	●	G
	●	●		●		●	●		●	●	●	H

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.).

	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.

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

GÅ TILL INDEX

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 ~~un~~known 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.

GÅ TILL INDEX

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

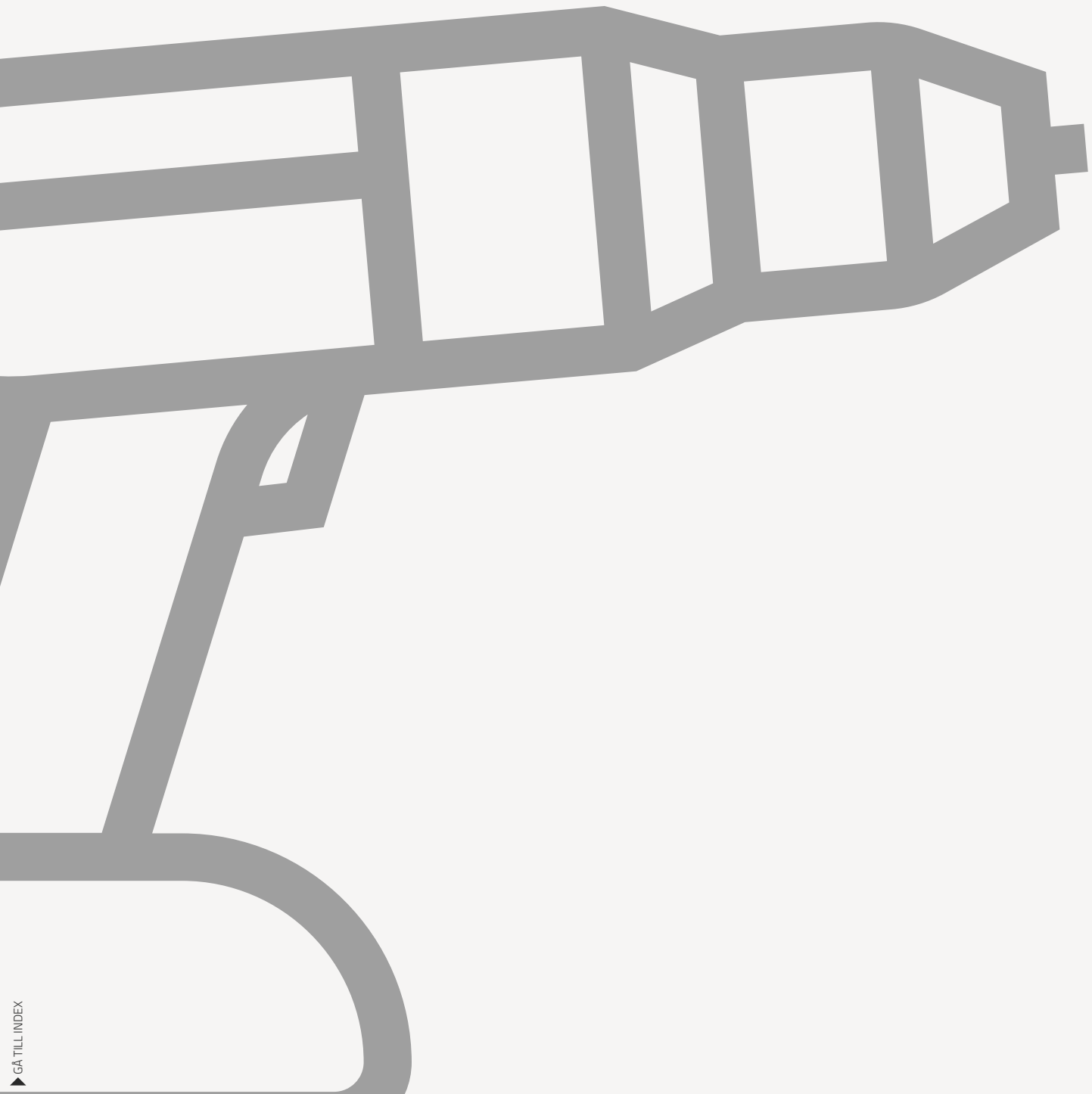
Furniture assembler
ISCO 8219s

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.



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

GÅ TILL INDEX

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 operational 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.

GÅ TILL INDEX

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

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	

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

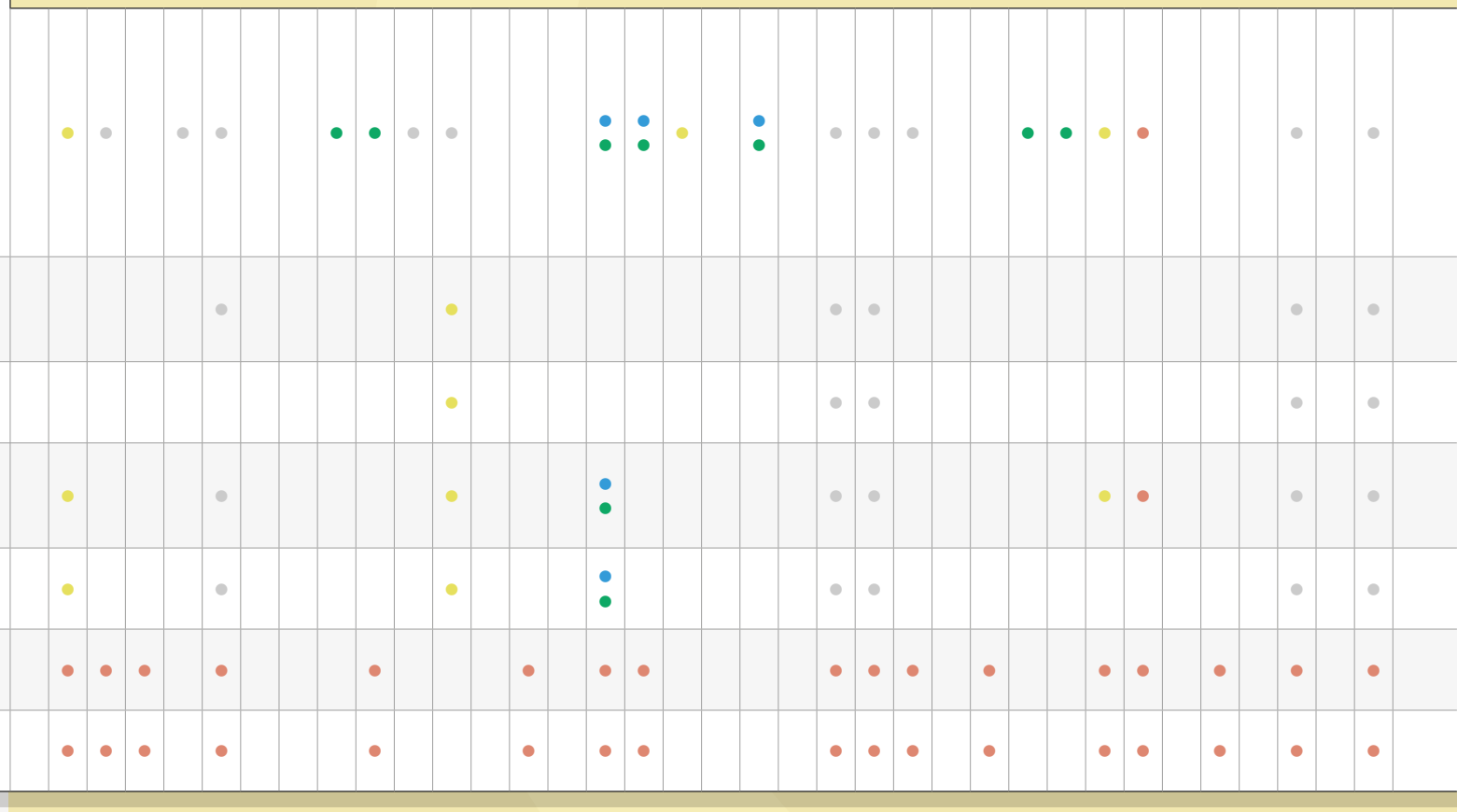
Fire and explosion hazards
- Flammable substances

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



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

GÅ TILL INDEX

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.

GÅ TILL INDEX

Factory hand ISCO 9329

2020
Occupational profile

Current profile description
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- 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.

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 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

Finland
bit.ly/39qFe6o

Sverige
bit.ly/2Xywndm

Norge
bit.ly/3i91XI1

Storbritannien
bit.ly/2XzY1XB

Danmark
bit.ly/38CyqmW

Irland
bit.ly/39I6duz

Nederländerna
bit.ly/3qj5Woy

Belgien
bit.ly/3i8MRlW

Schweiz
bit.ly/3i8eoE5

Lichtenstein
bit.ly/3qgl8T7

Frankrike
bit.ly/2Lw2Ezp

Portugal
bit.ly/3bGGsNP

Spanien
bit.ly/2XBbGxn

Italien
bit.ly/2LI5nvD

Bosnien-Hercegovina
bit.ly/35DH42J

Montenegro
bit.ly/3ibgy64

Albanien
bit.ly/35CGimv

Kartläggning av initiativ till cirkulär ekonomi inom EU

Strategier för cirkulär ekonomi har utvecklats i europeiska städer, regioner och länder de senaste åren. Sedan 2014 har 33 strategier antagits och minst 29 till är under utveckling.

Vi har tagit fram en specifik rapport "Samling av relevanta initiativ som stöder cirkulär ekonomi i EU", som inte utgör sig för att vara en fullständig lista, men den innehåller exempel på olika metoder för att främja cirkulär ekonomi i flera EU-länder. De flesta av dem är inriktade på resurseffektivitet och avfallsminskning, men andra ämnen som hållbara utvecklingsmål eller klimatförändringar täcks också av vissa initiativ. Du hittar den fullständiga rapporten på: bit.ly/2KqAu8l

Länkarna på den här kartan låter dig komma åt specifika rapporter som producerats av EIONET med en översikt över policyer, strategier och mål för 32 europeiska länder relaterade till deras resurseffektivitet och cirkulära ekonomi och deras utvecklingsnivå.

Andra relevanta informationskällor som används i rapporten om initiativ, strategier och analyser relaterade till cirkulär ekonomi är:

- Strategier och färdplaner för cirkulär ekonomi i Europa: Identifiera synergier och potentialen för samarbete och alliansbyggande - Studie av Europeiska ekonomiska och sociala kommittén: bit.ly/2NchxqZ
- Europeisk intressentplattform för cirkulär ekonomi: bit.ly/3bRv8hM

Estland
bit.ly/3oJJrsc

Lettland
bit.ly/3ibevP2

Litauen
bit.ly/3svHRN8

Polen
bit.ly/3qglh97

Tyskland
bit.ly/3qhY6vi

Tjeckien
bit.ly/2N2m67h

Slovakien
bit.ly/2LspqrS

Österrike
bit.ly/2LHqt74

Ungern
bit.ly/3nDPhtV

Slovenien
bit.ly/2LwEMeO

Kroatien
bit.ly/39wj2b9

Serbien
bit.ly/35BPwQd

Turkiet
bit.ly/3nF8A6b

Bulgarien
bit.ly/2LwMjKF

Nordmakedonien
bit.ly/2LqUfgs

Slutsatser

Möbelproducenter som anammar cirkularitet och cirkulär praxis kommer att bli allt vanligare, eftersom cirkulär ekonomi är nyckeln till att hantera klimat- och miljöutmaningar och kraven på bidrag från sektorn ständigt kommer att öka. Cirkulariteten är i ett tidigt skede och resultaten kommer att ses på medellång sikt.

Två nyligen genomförda EU-initiativ kommer att underlätta denna övergång till en cirkulär ekonomi. Å ena sidan Europeiska gröna given (COM (2019) 640 slutgiltig), som kommer att stödja och påskynda EU:s industriövergång till en hållbar modell för inkluderande tillväxt och å andra sidan den nya handlingsplanen för cirkulär ekonomi (COM (2020)98 slutgiltig), där möbelsektorn specifikt nämns som en av de prioriterade produktgrupperna inom ramen för de värdekedjor som planen riktar sig till.

SAWYER-projektets vision för 2030 är följande:

*År 2030, med en brett **digitaliserad möbelsektor**, kommer den träbaserade möbeltillverkningsindustrin att erbjuda **produkter och tjänster** med **miljömedveten design**baserad på **låg påverkan och spårbara råvaror, hållbara tillverkningsprocesser** och främjande av de **bästa användnings- och återvinningsscenarierna** för material och kasserade produkter. Kunder (B2B eller B2C) kommer att kräva mer detaljerad information om produkter och deras **hållbara egenskaper**, inklusive livscykelindikatorer, och konsumenternas egenmakt kommer att vara nyckeln till att cirkuleringsmålen ska lyckas Myndigheter (på lokal, nationell och europeisk nivå) kommer att underlätta cirkulariteten genom att öka **hållbara scenarion** för uttjänta material och träbaserade produkter, utvidga **gröna offentliga och privata upphandlingssystem** och främja **policyer för materialeffektivitet**.*

I analysen som implementerades i SAWYER visade specifika faktorer / åtgärder en högre inverkan på de flesta bedömda yrkesprofiler, som:

- Växla till förnybara material;
- Återanvänd produkter under hela deras tekniska livstid;
- Förläng produkters livstid genom reparation;
- Förläng produkters livstid genom design för hållbarhet;
- Öka produkters prestanda / effektivitet;
- Öka effektiviteten i produktionsprocesserna;
- Omtillverkning av produkter och / eller komponenter;
- Återvinn material;
- Främja kaskadanvändning av trä;
- Virtualisera indirekta aspekter av produkten;
- Byt ut gamla material mot avancerade förnybara material
- Tillämpa ny teknik.

För att klara av de utmaningar som övergången till en cirkulär ekonomi medför och för att utnyttja de möjligheter som den erbjuder måste intressenter i EU:s möbelsektor titta på denna övergång som en del av sektorns **dubbelövergång** (grön och digital), eftersom de är nära besläktade . Som DIGIT-FUR-projektets resultat förutsagt kommer träbelindustrin att erbjuda personliga smarta produkter och tjänster baserade på digitala tillverkningssystem som tillhandahålls av resurseffektiva och hållbara industrier. Ett antal olika tekniker (t.ex. billiga avancerade sensorer, IoT / IIoT, nästa generations internet, dataanalys, artificiell intelligens, VR / AR, kollaborativa robotar, etc ...) kommer att erbjuda transformativa affärspotentialer, både när det gäller produkter, som kan utvecklas och produceras, och själva tillverkningsprocesserna, för de som kan använda dem. En annan krävande utmaning för träbelindustrin är att tillhandahålla arbetstagarnas nödvändiga färdigheter för att effektivt hantera denna digitala omvandling. Sammantaget kommer Industry 4.0-teknik att påverka sektorns produktionsprocesser kraftigt under de kommande åren och kommer också att gynna sektorövergången mot en mer cirkulär ekonomi.

Ur ett övergripande perspektiv bör sektorns dubbelövergång representera referensramen för all framtida sektoranalys, företagens innovation för produkter och produktionsprocesser, innovativa affärsmodeller, sektorspolitik och följaktligen sektorns sociala dialog.

Ur ett digitaliseringsperspektiv förvandlas möbelindustrin snabbt från en traditionell industri till en datoriserad industrisektor. Baserat på de förväntade förändringarna i de analyserade jobbprofilerna - med hjälp av McKinsey-medlen och med hänsyn till Industry 4.0-teknologierna - prognostiserade DIGIT-FUR **förändringarna i efterfrågan på färdigheter, kunskap och kompetenser**. Framtida anställda inom möbelindustrin måste inte bara kunna utföra uppgifter effektivt, utan de måste också ha kompetens och förmåga att känna igen och anta kontinuerliga förändringar. Den kvalifikationsnivå som krävs kommer att bli högre och mer specialiserad eftersom kärnan i färdigheterna blir mer abstrakt på grund av digitalisering / datorisering.

Det finns inget ökat behov av hårda färdigheter, men de hårda färdigheterna eller tekniska färdigheterna behöver en fullständig integration av (alla relevanta) digitala färdigheter. Teknisk kunskap är fortfarande nödvändig och utgör grunden; kognitiva, sociala och beteendemässiga färdigheter kommer att bli en prioritet. Människor kommer inte längre att väljas baserat på sitt examensbevis, utan som funktion av deras tankesätt. Varje individ kommer att ansvarig för sin egen skicklighet i lärande och självförbättring.

För vissa yrkesprofiler krävs **nya gröna färdigheter**, eftersom det kommer att finnas vissa nya, specifika uppgifter relaterade till demontering och återanvändning, omtillverkning, återvinning och upcycling. Dessa nya färdigheter är särskilt (mer) viktiga för de "praktiska" profilernas uppgifter. Vi namnger följande:

- demontera träbaserade möbelprodukter
- undersöka demonterade bitar för ytterligare steg (återanvändning, omtillverkning, återvinning, upcycling)
- reparera träbaserade möbler där det behövs

Dessa nya gröna färdigheter kommer också att ha en inverkan, men inte lika signifikant, på de profiler som hanterar och fattar strategiska beslut inom företaget. Dessa färdigheter kommer som en "påfyllning" av de befintliga, nödvändiga färdigheterna för de undersökta yrkesprofilerna.

Dessutom **definierades generiska gröna färdigheter, kunskaper och kompetenser** som nödvändiga för social, ekonomisk och miljömässig utveckling inom träbelbranschen. Dessa generiska gröna färdigheter är i linje med nyckelkompetenser eller mjuka färdigheter, som har kontextualiserats inom perspektivet av miljömedvetenhet och förståelsen för hållbar utveckling och cirkulär ekonomi.

Möbelindustrins dubbelövergång innebär **nya utmaningar för arbetsmiljö och -hälsa**. Möbelindustrin kan vara **verkligt hållbar** (miljömässigt, socialt och ekonomiskt) endast när man säkerställer säkerheten, hälsan och välfärden för **dess viktigaste resurs: dess arbetstagare** - eller åtminstone kan den inte vara hållbar utan att skydda deras säkerhet och hälsa på det mest effektiva sättet.

Nya typer av arbetsplatser, nya processer, ny teknik och nya material / produkter kan påverka arbetstagarnas säkerhet och hälsa, men om de ordentligt planeras och distribueras kan **arbetstagarnas hälsa och säkerhet** tydligt förbättras. Ur digitaliseringsperspektivet kan robotar och digital teknik göra arbete som är fysiskt krävande eller monotont, lättare, effektivare och säkrare. Arbetstagare kan avlägsnas från farliga miljöer och sensorer kan automatiskt ange om en maskin behöver underhåll och därmed minska risken för maskinfel och tillbud. Typiska faror inom möbelindustrin som farliga ämnen, damm, farliga maskiner och verktyg kvarstår, men risken att utsättas för dessa risker kommer att minskas.

Analysen visar att övergången till en mer cirkulär ekonomi kommer att **förbättra den globala miljön**, men under inga omständigheter bör den minska arbetstagarnas hälsa och säkerhet. Av denna anledning måste vi, intressenterna inom möbelsektorn, se till att denna övergång och dess nya teknik eller arbetsprocesser inte leder till nya faror. Och vi måste se till att nya och återvunna material inte kan utsätta arbetstagarna för "nya" eller dolda farliga ämnen**. Cirkulär ekonomi inom sektorn**, som tar hänsyn till arbetsmiljö och miljöfrågor, bör **implementeras genom säkrare och effektivare maskiner, arbetsprocesser och material** som kan styra arbetstagarnas kemiska och fysiska risker. Tillämpningen av **ekodesign**koncept på produkter bör underlätta återvinnings- och reparationsåtgärder, minska ergonomiska risker och bör minska halten av farliga ämnen och minska kemiska risker i hela värdekedjan. Arbetarnas säkerhet och hälsa kan öka genom att integrera arbetsmiljöhanteringen i företagens kvalitetsstyrningssystem.

Möbelsektorns dubbelövergång kan leda till nya utmaningar och stressproblem för arbetstagare om den inte styrs och implementeras på rätt sätt. Ökande arbetsbelastningar och uppgiftskomplexitet, för lång arbetstid och konstant tillgänglighet ger upphov till spänning och lidande på jobbet, vilket leder till psykosociala risker (EUOSHA, 2015). För att undvika dessa nya risker blir **förvärv av ny kunskap, kapacitet och flexibilitet** för att korrekt hantera ökande automatisering, nya processer och utveckling av nya produkter ett verkligt och viktigt behov för alla arbetstagare inom sektorn.

Resultaten av dessa analyser av SAWYER-projektet är användbara för att:

- förstå hur arbetstagarnas jobb och säkerhet kommer att utvecklas på grund av effekterna av den cirkulära ekonomin.
- att förbereda företag och arbetstagare för att möta och utnyttja kommande utmaningar och möjligheter; och
- att ha en starkare grund för framtida diskussioner och samarbeten inom den europeiska sociala dialogen.

Dessa kombinerade analyser av digitalisering och cirkularitet - dubbelövergången - har också visat relevanta synergier mellan dem. Till exempel relaterat till:

- ~~h~~ur miljöinformation om produkter (t.ex. innehåll av farliga ämnen, återanvändbara delar, återvinningsbara material etc.) måste samlas in och kommuniceras längs leveranskedjan tills kunden eller återvinnaren nås;
- ~~h~~ur man går över från produkter till tjänster (virtualisering, dematerialisering, servisering osv ...);
- ~~h~~ur man minskar miljöpåverkan från tillverkningsprocesserna genom att använda ny teknik (t.ex. energieffektivitet, avfallsminskning, råvaruoptimering etc.).

Denna synergianalys förstärker visionen att EU:s framtida möbelsektor kommer att påverkas kraftigt av dubbelövergången och att alla intressenter försiktigt måste hantera digitala och cirkulära utmaningar för att på bästa sätt utnyttja alla de möjligheter de erbjuder.

Rekommendationer

Vägen till en cirkulär ekonomi **kräver samarbete mellan olika aktörer**, allt från politiska beslutsfattare, industri, experter, den akademiska världen och konsumenter. För att aktivera och påskynda övergången mot en mer cirkulär ekonomi, bör **industrins erbjudande av mer cirkulära produkter** expandera tillsammans med **marknaden och konsumenternas efterfrågan** på sådana produkter. För att uppnå detta spelar **yrkesutbildningsleverantörer och beslutsfattare en nyckelroll** när det gäller att driva dessa två nyckeltrender, och därför kan du i följande delar av detta dokument hitta olika specifika rekommendationer för beslutsfattare och yrkesutbildningssystemet som kan stödja dem för att uppnå dessa relevanta mål.

Trots ovanstående och det faktum att flera av följande rekommendationer fokuserar på att hantera de utmaningar som sektorövergången innebär mot en mer cirkulär möbelsektor, är det viktigt att alltid komma ihåg att sektorn på praktisk nivå samtidigt och gemensamt kommer att påverkas av dubbelövergången (digital och grön). Detta är inte bara nödvändigt för att sektorsintressenter ska kunna hantera sektorsutmaningar, utan särskilt för att de ska kunna lyckas utnyttja de möjligheter som deras specifika och gemensamma inverkan erbjuder.

Beslutsfattare

Att säkerställa framgången för en övergång till en mer cirkulär ekonomi inom sektorns dubbelövergång kräver att **harmoniserade regler införs på EU-/internationell nivå** och att EU-initiativ genomförs **på ett konsekvent sätt av medlemsstaterna**, vilket minskar risken för fragmentering av den inre marknaden och **undvikande av hinder** för fri rörlighet för (mer) hållbara och cirkulära varor.

För att säkerställa ett smidigt genomförande av EU-initiativ behövs **enkla och smarta regler för cirkulär ekonomi**, tydliga definitioner på EU-nivå och ett **gemensamt språk**, särskilt när det gäller parametrar som mäter cirkularitet, som 'lång livslängd', 'återanvändning', 'återvinningsbarhet ', bland andra. Detta är nyckeln till att **ge konsumenterna harmoniserad information**. EU:s initiativ för hållbar produktpolitik bör tillhandahålla förtydliganden och regler om dessa frågor. En av hörnstenarna kommer att utvidga tillämpningsområdet för ekodesigndirektivet till att omfatta icke-energirelaterade produkter, som möbler. Det stora utbudet av produkter som betraktas som ”möbler” och de olika material som används i deras produktion gör detta till en **komplex sektor att ta itu med**. Kriterier för ekodesign / cirkulär design fungerar inte för alla produkter på samma sätt. I detta sammanhang är det viktigt att ta hänsyn till möblernas komplexitet, behovet av en **steg-för-steg-strategi**, för **harmonisering** på europeisk **lagstiftningsnivå** och **över hela politiken**, och en **dialog** bör äga rum med branschen. (bit.ly/3a0Gihs)

När det gäller hinder för cirkulär design är de **viktigaste aspekterna att övervinna** tillgången på **utbytningsmaterial och delar**, liksom **bristen på information från leverantörer** om oroande ämnen och stränga nationella regler som leder till användning av oönskade kemikalier (som fall av giftiga flamskyddsmedel som ofta behövs för att uppfylla kraven för brandskydd). Inom denna ram bör EU:s kemikaliestrategi för hållbarhet och initiativet för hållbara produkter främja **minskningen av oroande ämnen** i möbelprodukter, vilket minskar arbetstagarnas exponering för kemikalier. Som dokumenterats av Alliansen för flamskyddsfria möbler (safefurniture.eu) migrerar flamskyddsmedel från produkter och ackumuleras i miljön och deras användning motverkar målen för en cirkulär ekonomi. Dessa kemikalier har ingen beprövad brandsäkerhetsfördel och det finns ett stort antal bevis för deras skadliga effekter på **människors och arbetstagares hälsa**, ökad **brandtoxicitet** och miljö (bit.ly/2Y6beHN // bit.ly/2KLXjni). De utgör en **undvikbar risk** för arbetstagare under produktion, försäljning och bearbetning av uttjänta material. Detta är en vanlig risk för tapetserare och den förväntas **minska eller försvinna** med **branschövergången** mot en mer cirkulär ekonomi och om de kommande policyverktygen kommer att ta itu med onödig **användning av giftiga flamskyddsmedel** i möbler.

Som en del av sektorns dubbelövergång kommer sektorövergången till den cirkulära ekonomin också att bero på andra parametrar, som **ökad digitalisering, innovativa verktyg** och **pågående innovations- och forskningsinsatser**. Dessa ansträngningar och investeringar för cirkularitet och utveckling av mer miljövänlig teknik bör stödjas av **finansieringsprogram** som Horizon Europe etc. Lämpliga investeringar bör underlätta denna övergång och garantera att den når alla inblandade aktörer, särskilt små och medelstora företag, och främja samarbetet mellan företag och intressenter. EU:s nya industriella strategi bör främja och underlätta dubbelövergången samtidigt som man ser på potentialerna i branschens digitalisering och cirkularitet.

De politiska initiativen, som europeiska gröna given eller handlingsplanen för den cirkulära ekonomin, bör **stimulera efterfrågan på marknaden** och erbjuda cirkulära produkter, **främja utvecklingen av nya affärsmodeller**, till exempel produkt-som-en-tjänst, främja återanvändning, renovering, omtillverkning , återvinning, avskaffningsmodeller, modeller baserade på möjliggörande av vård, reparation och renovering, återköp eller B2B-upphandling.

På grund av COVID19-pandemins enorma inverkan bör EU-institutionernas och medlemsstaternas ansträngningar fokuseras på återhämtningen från den sociala och ekonomiska krisen med hjälp av stimulanspaketet (t.ex. Next Generation EU, Faciliteten för återhämtning och resiliens och Europeiska socialfonden Plus) också för att bekämpa klimatförändringar, för att främja digitalisering och cirkulär ekonomi och för att **underlätta arbetstagarnas utbildning om ny teknik och gröna färdigheter**, särskilt för de lägre kvalificerade arbetstagarna, kvinnor, migranter, ungdomar och äldre arbetstagare.

Yrkesutbildningar

Utbildning är framtidens styrka eftersom det är ett av de mest kraftfulla instrumenten för förändring. Ett av de största problemen vi står inför är hur vi kan anpassa vårt sätt att tänka för att möta utmaningen i en alltmer komplex värld. Vi måste tänka nytt kring vårt sätt att organisera kunskap. Detta innebär att bryta ner de traditionella barriärerna mellan discipliner. Vi måste omforma **vår utbildningspolicy och våra program**. Och när vi genomför dessa reformer måste vi **hålla dem långsiktiga** och respektera vårt enorma ansvar för kommande generationer.

Möbelindustrins dubbelövergång skapar en **efterfrågan på nya specifika kompetenser och färdigheter** hos arbetskraften. Att förutse och bygga färdigheter för framtiden är avgörande för denna snabbt föränderliga och grönare arbetsmarknad. Detta gäller för alla förändringar av typer och nivåer av färdigheter som behövs, liksom inom yrkesmässiga och tekniska områden.

Det nuvarande utbudet av färdigheter matchar ofta inte denna efterfrågan på nya och anpassade färdigheter. Det finns en tydlig **klyfta mellan de kunskaper som behövs** för dubbelövergången inom möbelbranschen och det **nuvarande utbudet och anskaffandet av utbildning**.

UNESCO beskrev **Five Dimensions of Greening TVET (teknisk och yrkesmässig utbildning)** som en översättning av de **tre hållbarhetsdimensionerna** som måste tas upp - **miljö, ekonomisk och social** - till en nyckelram för att förstå inställningen till utbildning för hållbar utveckling.

I förhållande till dubbelövergången har vi också lagt till den digitala aspekten.

Baserat på dessa fem dimensioner av grönare TVET kan vi rekommendera följande:

Grönt och digitalt campus

Hantera campus när det gäller energi, vatten, avfall och hantering av föroreningar.

- För skolor och utbildningscenter är det nästan **omöjligt att hålla jämna steg med alla investeringar som behövs** för dubbelövergången, eftersom den nya tekniken utvecklas allt snabbare.

Därför bör ett grönt och digitalt campus också fokusera på **hybridinlärningsmiljöer**, inklusive i sin formella utbildning, ett erbjudande om arbetsbaserat lärande, dubbelt lärande och lärlingsplatser. Ett grönt och digitalt campus investerar i digitala inlärningsmetoder, i e-lärande genom MOOCS (Massive Open Online Courses, storskaliga, öppna och nätbaserade kurser), i gröna läroplaner.

Det gröna och digitala campus är ett **öppet campus**, där nystartade företag har sin plats, där företag välkomnas att investera som partner i ny teknik, i grön forskning och i nya, flexibla läroplaner.

Grön och digital läroplan

Integrering av utbildning för hållbar utveckling (ESD). Grön teknik, ren teknik, gröna jobb och grönare befintliga jobb. Därför finns det ett behov av gröna program och kurser, gröna metoder i kurser och workshops och ett bättre samspel mellan branscher och utbildningsinstitut.

Yrkesutbildningssystem måste vara **anpassningsbara och kontinuerligt utvecklas** (på ett smart sätt).

Som inspiration presenterar vi följande exempel på hur man uppnår gröna(re) färdigheter.

- Anpassa arbetsmarknadsinformation om grönare och digital ekonomi i utvecklingen av nya läroplaner och granska befintliga läroplaner med gröna och digitala aspekter. Detta kan göras av sektorråd, rådgivning till organ med ledare från (grön) industri, digitala mästare eller rådgivande kommittéer med lokala företag (för regional anpassning, sammanhang för lokal arbetsmarknad, etc.).

- För att införa cirkulär ekonomi i läroplanerna för yrkesutbildningsskolor kan företag komma till skolan och prata om hur de tillverkar produkter. Sedan överlämnar de sina produkter till elever/studenter för att låta dem omdesigna produkterna ur ett cirkulärt ekonomiskt perspektiv (circlevet.eu - Steve Parkinson).

- Utformningen och anpassningen eller modifieringen av läroplanerna bör svara eller till och med förutse de förändrade kompetensbehoven för dubbelövergången. Utformningen av program och modifiering av kurser och lärandemål i läroplaner som är uppbyggda på ett **modulärt** sätt eller **baserade på arbetsplatsbaserad utbildning** gör det mycket flexibelt att integrera den nya kompetensbehovet. Många kurser och program har redan modifierats för att integrera (vissa) aspekter av cirkulär ekonomi, hållbarhet och / eller digitalisering. Men detta är alltför ofta bara "i sidled" och för begränsat. Användning av trä från hållbara källor undervisas till exempel ofta endast i teoretiska lektioner, men ingår inte i upphandlingen av de använda resurserna i verkstäderna. Digitalisering lärs ut som ett begrepp, som en teori, men ofta inte integrerat i maskinverkstäderna, där datorerna är föråldrade och olämpliga för krävande VR / AR-program.

- Förutom anpassningen av läroplanerna för studenter behöver vi också anpassade utbildningsvägar för omskolning och arbetsplatsbaserad utbildning för "uppskolning" och "omskolning" av arbetskraften.

- Det fortlöpande lärandet är också en viktig nivå för att ta itu med ovan nämnda rekommendationer för läroplanerna. Ovan nämnda **nya leveransmetoder** (modulär, arbetsplatsbaserad, webbaserad distansutbildning, hybridinlärningsmetoder, utbildning utanför campus etc.) kan användas för att erbjuda **personliga utbildningsvägar on-demand** för alla som är intresserade. Det är viktigt att anpassa metoden till de specifika målgrupperna och att fokusera på att ändra tankesättet, snarare än att ta itu med rent tekniska frågor.

- Dubbelövergången måste spridas över alla institutioner, integreras i alla grenar och inom alla kursprogram och läroplaner.

En sådan integrerad, hållbar strategi kan bestå av:

- Utveckla färdigheter som är nödvändiga för att **implementera** hållbara och digitaliserade lösningar;
- Göra kopplingar mellan det valda programmet / läroplanen och dubbelövergången;
- Att vara en del av sammankopplade globala system;
- Integrerad förståelse för sociala, ekonomiska och miljömässiga system och diskutera praktiska lösningar på dubbelövergången;
- Hållbart tänkande och beslutsfattande som bidrag till lösningsbyggnadsprocessen för sociala, miljömässiga och ekonomiska kriser.
- Engagera elever i att lära sig "för", inte bara "om", dubbelövergången.

Grönt och digitalt samhälle

Anpassa samhället genom kapacitetsuppbyggnad, förnybar teknik och resursstöd.

Effektiva metoder för att förutse framtida kompetensbehov inkluderar en hållbar dialog mellan arbetsgivare och anställda, företag och utbildare, samordning mellan statliga institutioner, system för arbetsmarknadsinformation, arbetsförmedling och resultatgranskning av utbildningsinstitutioner. Samarbete och samarbete i alla led (beslutsfattande, praktiskt, organisatoriskt etc.) behövs. Det finns ett enormt behov av **involvering av alla intressenter**, utbildningsleverantörer, arbetsmarknadens parter (företag, arbetsgivar- och arbetstagarorganisationer och -federationer), universitet och den akademiska världen, sektoriella organisationer, offentliga arbetsförmedlingar och alla relevanta statliga partner (ministerier för utbildning, arbete, miljö, digitalisering ...). Till exempel för erkännande av färdigheter, för att utveckla **allianser av färdigheter inom sektorn, men också mellan sektorerna**.

Grön och digital forskning

Främja forskning inom områdena förnybar energi, gröna innovationer och återvinning av avfall.

I förhållande till dubbelövergången rekommenderar vi fler gemensamma åtgärder rörande **forskning om erkännande av färdigheter, utvecklade utanför de normala inlärningsvägarna**. Detta erkännande - som blir allt viktigare - måste vara öppet och stödjas av alla intressenter, inklusive statliga partners. Efter bara några år efter (hög-)skolor och universitetet blir den förvärvade kunskapen och färdigheterna i viss mån föråldrade på grund av den snabbt föränderliga miljön mot bakgrund av dubbelövergången. Endast kontinuerlig yrkesutbildning, vare sig den är formell, informell eller icke-formell, garanterar en bestående validering av en examen.

Grön och digital kultur

Främja en kultur med gröna värderingar, grön attityd, grön etik och gröna metoder.

I förhållande till dubbelövergången vill vi lägga till **en digital kultur** (digital attityd, digital etik och digital praxis).

Förutom denna gröna och digitala kultur rekommenderar vi att man anpassar en **inlärningskultur i företaget** som integrerar informellt och icke-formellt lärande. Arbetstagare måste ges tid och frihet för att på rätt sätt lära sig och gynna sina företag. Tack vare flexibla och modulära inlärningsvägar, på plats eller utanför anläggningen, arbetsbaserad, precis i tid, där det behövs (på rätt plats och med rätt format), vid behov (vid rätt tid), kan arbetstagare lära sig under hela sitt arbetsliv och arbetssituation. Utmaningen är att se till att eleverna får **tillgång till kvalitativ information** (se digital kompetens). Det måste ägnas tillräcklig uppmärksamhet åt den högutbildade arbetskraften. Dessa anställda kommer också att bli ansvariga för att utbilda arbetskraften med färre färdigheter. Både **förväntningar** och **möjligheter** till inlärning ökar.

Gröna färdigheter

Studier av framtida behov stöder vikten av mjuka färdigheter, samarbete och digital kompetens. De definierade generiska gröna färdigheterna hänvisar också till dessa mjuka färdigheter.

De digitala kompetensen som behövs och de generiska gröna färdigheterna skiljer sig inte mycket åt. Ofta är det sammanhanget och situationen, målet eller målet som utgår från en annan synvinkel. Följande tabell visar de definierade (nya) generiska gröna färdigheterna (till vänster) och de nödvändiga digitala färdigheterna (till höger), som de definierades i Digit-Fur-projektet. Eftersom de digitala färdigheterna definierades på ett mer allmänt sätt än de generiska gröna färdigheterna (som är mer detaljerade) kan vi relatera de digitala färdigheterna mer än en gång med de gröna färdigheterna (kursiv).

Förutom dessa generiska ”mjuka” färdigheter behöver vi också integrera och bädda in de tekniska gröna och / eller digitala färdigheterna.

Tabell 9. - Nya gröna färdigheter och deras koppling till digitala färdigheter.

Miljömedvetenhet och vilja att lära sig	Digital kompetens
System- och riskanalysfärdigheter	Kritiskt tänkande och problemlösning
Innovationsförmågor	Nyfikenhet och innovation
Koordinerings-, lednings- och affärsfärdigheter	*Initiativ och entreprenörskap*
Kommunikations- och förhandlingsförmågor	Effektiv kommunikation
Marknadsföringsfärdigheter	*Effektiv kommunikation*
Strategiska och ledande färdigheter	*Initiativ och entreprenörskap*
Konsultfärdigheter	*Effektiv kommunikation*
Färdigheter inom nätverk, informationsteknik och språk	Samarbete mellan nätverk
Anpassnings- och överföringsförmågor	Smidighet och anpassningsförmåga
Entreprenörsfärdigheter	Initiativ och entreprenörskap
Kvantifiering och bevakning av avfall, energi och vatten	Informationsinhämtning
Materialanvändning och effektkvantifiering och bevakning vid upphandling och urval	*Informationsinhämtning*
Minimering av materialanvändning och påverkan (konsekvensbedömning)	*Informationsinhämtning*

Formell yrkesutbildning

Formell yrkesutbildning är bredare än den endast arbetsmarknadsinriktade och är fortsatt viktig. Den nya ökade **efterfrågan efter de rätta mjuka färdigheterna måste stödjas** på ett starkare sätt. Trots vikten av dessa mjuka färdigheter får systemet inte tappa **grundläggande tekniska kompetenser** ur sikte, och behovet av en uppdaterad teknisk utbildning kvarstår. Man kan bara vara framgångsrikt kreativ i sitt jobb om man också har de grundläggande färdigheterna.

- Ett **bättre samarbete** mellan utbildning och sektor behövs, särskilt för tekniska program. De framtida anställda inom sektorn måste kunna utföra uppgifter effektivt, men de behöver också **färdigheter och kapacitet för att känna igen de kommande förändringarna och anpassa sig till dem**. Tvärvetenskapliga färdigheter och förmågor ökar betydande och **företag kommer att kräva högre och mer specialiserade kvalifikationsnivåer**.
- Denna kompetensförskjutning pekar också på vikten av **yrkeskvalificeringsprofiler** (upprättade av sektorn), som **bas för lärandevägarna i utbildningen**.

Inledande yrkesutbildning versus kontinuerlig yrkesutbildning

- Det finns en allt större betydelse för **system som styrs av efterfrågan**, som lärlingsplatser, dubbelt lärande eller arbetsplatsbaserat lärande. Dessa system måste implementeras i båda yrkesutbildningssystemen.
- Befintliga inledande yrkesutbildningssystem och kontinuerliga yrkesutbildningssystem måste **anta den nya gröna och digitala tekniken**. Utbildningspartners och utbildningsleverantörer måste ha ett nära samarbete med företag. Inte bara tekniska färdigheter och specialiserad domänspecifik kunskap om dubbelövergången behövs. De definierade generiska mjuka färdigheterna är lika viktiga.

Slutligen kan vi dra slutsatsen att för ett modernt system för **inlärningssystem** behöver vi **samarbete** mellan alla intressenter och partners för att framgångsrikt implementera och integrera de nya kompetensbehoven för denna dubbelövergång. Samarbete som kräver att alla intressenters uppmärksamhet och handlingar fokuseras på ett kompletterande och samarbetsvilligt sätt.

Samarbete mellan **yrkesutbildningsmyndigheter och utbildningsmyndigheter** behövs för att integrera de nya kompetensuppsättningarna för en grön och digital värld, redan i ett tidigt skede, till exempel i grundskolan, och dessa färdigheter måste vidareutvecklas under gymnasiet.

Samarbete mellan **utbildningsleverantörer och företag** behövs för att tillhandahålla flexibla och anpassningsbara inlärningsvägar, på plats eller utanför anläggningen, arbetsbaserat, precis i tid, där det behövs (på rätt plats och med rätt format), vid behov (vid rätt tid).

Samarbete mellan **arbetstagarnas sociala partners och föreningar** behövs för att stödja och underlätta de förutsättningar som gör det möjligt för arbetstagarna att få den kompetens och färdigheter som krävs för att möta dubbelövergången i sektorn. Sektorns **arbetskraft** kommer att behöva anta ett nytt tänkesätt för kontinuerligt lärande (livslångt lärande). De måste kontinuerligt uppdatera sin kunskap om de nya arbetsmiljöriskerna och agera därefter. Sammantaget kommer varje individ att bli ansvarig för sina egna framtida färdigheter och skicklighet.

Tillsammans i partnerskap mellan arbetsgivare, myndigheter och utbildningsinstitut kan vi arbeta med att utveckla efterfrågade färdigheter för dubbelövergången, för att förutse, bygga och förbättra kompetensen hos alla intressenter (lärare, studenter, föräldrar, arbetsgivare, medarbetare, administrationer osv ...). På detta sätt väntar oss en ljus framtid inom möbelbranschen.

För i framtiden kommer varje jobb att vara ett grönt och digitalt jobb!

Bibliography

From the SAWYER project results/publications

- Collection of relevant initiatives supporting circular economy in the EU (2020). bit.ly/3iMxGzb
- The State-of-the-art of circular economy in the furniture sector in 7 EU countries (2020). bit.ly/3a28bGd
- Summary Table: Update of the State-of-the-art of circular economy at EU level (2020). bit.ly/3cd0ShC
- The SAWYER forecasting survey results (2020). bit.ly/3cgDY8X
- The State-of-the-art of circular economy in the furniture sector at EU level (2020). bit.ly/3qPSRTK
- Furniture Sector Forecasted Scenario in relation to Circular Economy in 2030 (2020). bit.ly/3a70w9s

General sources

- Bauer B. et al, Nordic Council of Ministers. Potential Ecodesign Requirements for Textiles and Furniture, 2018. bit.ly/2M6pPAr
- Ellen MacArthur Foundation, Growth Within: a circular economy vision for a competitive Europe, 2015. bit.ly/2MreFWM
- Leka S., Jain A., Impact of Psychosocial Hazards at Work: An Overview, Institute of Work, Health & Organisations, University of Nottingham Health, 2010. Source: apps.who.int Available at: bit.ly/2LOdw7i
- Malenfer M., Héry M, Montagnon C. – INRS A circular economy in 2040. What impact on occupational safety and health? What prevention?, 2019. bit.ly/2M4QNIS
- Montgomery D. L. Safe and healthy life, Health and Safety in the Woodworking Industry, 2017. Source: safeandhealthylife.com Available at: bit.ly/2AvHuJ0
- Pavlova M. - Fostering inclusive, sustainable economic growth and 'green' skills development in learning cities through partnerships. International Review of Education: Journal of Lifelong learning, 2018. bit.ly/2YgCun2
- Storesund K. et al. BRANDFORSK - RISE Research Institutes of Sweden, Fire safe furniture in a sustainable perspective, 2019. bit.ly/3a4d3KW

European Union funded projects

- Bolster-Up II - Core profiles for wood and furniture professions. bolster-up2.eu
- DIGIT-FUR - Impacts of the Digital Transformation in the Wood Furniture Industry. digit-fur.eu
- CircleVET - circlevet.eu
- DITRAMA – Digital Transformation Manager, leading companies in Furniture value chain to implement their digital transformation strategy. ditrama.eu
- EQ-WOOD - The innovation manager for the wood and furniture industry. eqwood.org
- FUNES – Furniture New European Skills 2020. funesproject.eu
- FURN360 – Circular business training for the furniture and woodworking sectors. furn360.eu
- GPP 2020 procurement for a low-carbon economy. gpp2020.eu/home
- GPP Furniture An innovative and open learning resource for professionals of the furniture industry to expand their knowledge and provide added value for the Green Public Procurement. gpp-furniture.eu/
- SPP Regions – Regional networks for sustainable procurement sppregions.eu/home
- WOODUAL - Wood Sector and Dual Learning for Youth Employment and Skills adapt.it/WOODual

European Union sources

- CASCADES. Study on the optimised cascading use of wood – Final report. European Commission. July 2016. bit.ly/36o8bPx
- CEDEFOP (2015) Spotlight on VET, Anniversary Edition, Vocational education and training systems in Europe. Source: cedefop.europa.eu. Available at: bit.ly/1JWFIAj
- CEDEFOP Spotlight on VET country reports. cedefop.europa.eu
- CEN European Committee for Standardization. cen.eu
- Circular Economy Action plan. European Commission COM (2015) 614. bit.ly/36e16B6
- Circular economy strategies and roadmaps in Europe: Identifying synergies and the potential for cooperation and alliance building – Study by the European Economic and Social Committee. bit.ly/3sWYiSC
- Communication Closing the loop - An EU action plan for the Circular Economy COM/2015/0614 final. bit.ly/3plg0gC
- Circular Economy Opportunities in the Furniture Sector - European Environmental Bureau (EEB), September 2017. bit.ly/3iO3iEr
- Commission General Report on the operation of REACH and review of certain elements Conclusions and Actions Conclusions and Actions. European Commission Communication (COM(2018) 116 final). bit.ly/3oqwT8s
- Communication A New Industrial Strategy for Europe COM/2020/102 final. bit.ly/3pmK8YR
- Communication The European Green Deal COM/2019/640 final. bit.ly/3qMxa70
- Communication on Public procurement for a better environment (COM (2008) 400). bit.ly/3oqx8jS
- Country factsheets on resource efficiency and circular economy in Europe (2019). bit.ly/3c9aCJL
- Development of Guidance on Extended Producer Responsibility (EPR), developed by BIO Intelligence Service for theEuropeanCommission, 2014. bit.ly/3a7wltd
- DG Energy - Renewable Energy Directive. bit.ly/3t5MSfJ
- DG Environment - Circular Economy. bit.ly/36e16B6
- DG Environment - EMAS. bit.ly/3iNvhUN

- DG Environment - End of Waste Directive. bit.ly/39iNHK4
- DG Environment - EU Ecolabel. bit.ly/3qRbref
- DG Environment - Green public procurement. bit.ly/2MqZBIZ
- DG Environment - Timber regulation. bit.ly/36eQUZ5
- Directive 2004/37/EC on the protection of workers from the risks related to exposure to carcinogens or mutagens at work bit.ly/36d7kRT
- Directive 2008/98/EC on waste (Waste Framework Directive). bit.ly/3iZ3ykp
- Directive (EU) 2019/904 on the reduction of the impact of certain plastic products on the environment. bit.ly/3a9amHQ
- ECHA European Chemicals Agency. echa.europa.eu
- Ecodesign Directive 2009/125/EC establishing a framework for the setting of ecodesign requirements for energy-related products. bit.ly/2Yeg8CL
- Ecodesign Directive (2009/125/EC) European Implementation Assessment. EPRS - European Parliamentary Research Service. PE 611.015, November 2017. bit.ly/36eRmXh
- Ecodesign Working Plan 2016-2019 (European Commission). bit.ly/2LXjWpu
- Ecolabel Facts and Figures. bit.ly/3cbM1DX
- EEA Report No 26/2019 - Resource efficiency and the circular economy in Europe 2019 – even more from less – EIONET. bit.ly/3c9bkGV
- EMAS EU Eco-Management and Audit Scheme. bit.ly/3iNvhUN
- Environmental Implementation Review 2019 of the European Commission (COM(2019) 149 final). bit.ly/2L2MDAG
- ESCO, European Skills, Competences, Qualifications and Occupations website. Source: ec.europa.eu Available at: bit.ly/2GWtpdb
- ESCOpedia. bit.ly/3pf2ScN
- EU-OSHA (European Agency for Safety and Health at Work) (2009). The human machine interface as an emerging risk. Source: osha.europa.eu Available at: bit.ly/2CQQ4UI
- EU Forest Strategy. European Commission Communication. COM(2013) 659 final. bit.ly/3qRc07R
- EU-OSHA (European Agency for Safety and Health at Work) (2013a). Green jobs and occupational safety and health: Foresight on new and emerging risks associated with new technologies by 2020. Source: osha.europa.eu Available at: bit.ly/2F7ZrjV
- EU-OSHA (European Agency for Safety and Health at Work) (2013a). Priorities for occupational safety and health research in Europe: 2013-2020. bit.ly/2LW1mht
- EU-OSHA (European Agency for Safety and Health at Work) (2017). Key trends and drivers of change in information and communication technologies and work location. Source: osha.europa.eu Available at: bit.ly/2qVC6Ys
- European Agency for safety and health at work (EU OSHA), OSH Wiki, Psychosocial risks and workers health, 2013. Source: oshwiki.eu Available at: bit.ly/2F83Nrc
- European Commission. Bioeconomy. bit.ly/3iKarWw
- European Commission. EU Forestry. bit.ly/2M8dbkD
- European Green Deal. bit.ly/3sRkLk2
- EUROSTAT. ec.europa.eu/eurostat
- Forest Information System for Europe (FISE). bit.ly/39jBUuV
- GPP National Action Plans. bit.ly/3iO5sUz
- Guidance on cascading use of biomass with selected good practice examples on woody biomass. European Commission, August 2019. bit.ly/2YgMeO8
- Monitoring Framework for the Circular Economy. bit.ly/36h0dIe
- National renewable energy action plans and progress reports data portal. bit.ly/3qSrBE3
- New Skills Agenda for Europe. bit.ly/3sZgBH2
- Occupational Safety and Health Administration - OSHA, Guide for Protecting Workers from Woodworking Hazards (1999). Source: osha.gov Available at: bit.ly/2CO0GD7
- Opinion of the EESC - A new Circular Economy Action Plan For a cleaner and more competitive Europe COM(2020) 98 final. bit.ly/2YhWipW
- Organisation and Product Environmental Footprint. bit.ly/2YdvCqj
- REACH Regulation (EC 1907/2006). bit.ly/3onXC5k
- Regulation (EU) 2017/1369 setting a framework for energy labelling and repealing Directive 2010/30/EU. bit.ly/2Yiyy54
- Regulation (EU) No 2019/1021 on persistent organic pollutants (POPs Regulation). bit.ly/3cbdPZ4
- Report from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on the implementation of the Circular Economy Action Plan {SWD(2019) 90 final}. bit.ly/3pmhAyy
- Revision of the EU Green Public Procurement (GPP) criteria for Furniture. Joint Research Center. August 2017. bit.ly/2YiEyeh
- RoHS Directive. bit.ly/3t0UDTR
- Stepping up EU Action to Protect and Restore the World's Forests. European Commission Communication COM(2019) 352 final. bit.ly/2MnxytY
- Sustainable Products in a Circular Economy - Towards an EU Product Policy. Framework contributing to the Circular Economy.- Commission Staff Working Document SWD(2019) 91 final. bit.ly/36eDufQ
- The uptake of green public procurement in the EU27. Centre for European Policy Studies (CEPS) for the European Commission, February 2012. bit.ly/2MnQZTt

- TNO, ZSI, SEOR, Investing in the Future of Jobs and Skills - Scenarios, implications and options in anticipation of future skills and knowledge needs, Furniture (2009), EC. Source: ec.europa.eu Available at: bit.ly/2F95DrU
- WEEE Directive 2012/19/EU of the European Parliament and of the Council of 4 July 2012 on waste electrical and electronic equipment. bit.ly/3pkJpYg
- WEEE compliance promotion exercise. Final Report (developed by Bipro for the European Commission), December 2017. bit.ly/3sX9JK1

Other documents

- Digit-fur forecasting scenario of the EU wood furniture industry in 2025 (2018). bit.ly/2LW2YI3
- EFIC - Sustainable Products Initiative - European furniture industry insights in view of upcoming proposal for a Directive, 2020 bit.ly/3aamvfB
- Furniturelink, Occupational Health and Safety (2016). Source: furniturelinkca.com Available at: bit.ly/2Au2zmS
- German statutory accident insurance for the wood and metal industry (Berufsgenossenschaft Holz und Metall BGHM), Gefahrstoffe im Schreiner-/Tischlerhandwerk und der Möbelfertigung-Handhabung und sicheres Arbeiten, DGUV 209-040, 2010. Source: bghm.de Available at: bit.ly/2F5d8kt
- Health and Safety Executive (HSE), Manual handling solutions in woodworking, 2013. Source: hse.gov.uk Available at: bit.ly/2QmPSPT
- Health and Safety Executive (HSE), Wood dust Controlling the risks, Woodworking Sheet No 23 (Revision 1), 2012. Source: hse.gov.uk Available at: bit.ly/2s8r9VQ
- HSE, Wood furniture and windows - Managing occupational health risks. Source: hse.gov.uk Available at: bit.ly/2Vw6sRw
- Impacts of the digital transformation in the wood furniture industry – final results (2019). bit.ly/3a7b4W6
- LIGNUM.- Spanish Information System on Wood Trade. bit.ly/3cdCJqY
- Plan Estatal Marco de Gestión de Residuos (PEMAR) 2016-2022. BOE number 297, 12/12/2015. bit.ly/2MsOtLn
- Spanish Circular Economy Strategy. Circular Spain 2030. Spanish Ministry for Ecological Transition, February 2018. bit.ly/3oegy6w
- Work Safe Western Australia, Safe use of Chemicals in the Woodworking Industry Guidance note (2001). Source: commerce.wa.gov.au Available at: bit.ly/2RCWQFv
- WorkSafe, A guide to safety in the wood products manufacturing industry, First edition, 2007. Source: worksafe.vic.gov.au Available at: bit.ly/2nz0NuJ

Other sources/websites

- AENOR. aenor.com
- Alliance for Flame Retardant Free Furniture in Europe. safefurniture.eu
- Basque Ecodesign Center. basqueecodesigncenter.net
- BREEAM (The Building Research Establishment's Environmental Assessment Method). breeam.com
- Blue Angel Ecolabel. blauer-engel.de
- CEN/CENELEC.- CEN/CLC/JTC 10. cencenelec.eu
- Ecolabel Index. ecolabelindex.com
- écoMobilier. ecomobilier.fr
- Ellen MacArthur Foundation. ellenmacarthurfoundation.org
- EPD System. environdec.com
- European Circular Economy Stakeholder Platform circulareconomy.europa.eu/platform
- Forest Law Enforcement, Governance and Trade. flegt.org
- FSC (Forest Stewardship Council). ic.fsc.org
- Generalitat de Catalunya. web.gencat.cat
- I4R Platform. i4r-platform.eu
- IHOBE. ihobe.eus
- ISO - International Organization for Standardization. iso.org
- LEED (Leadership in Energy and Environmental Design). new.usgbc.org/leed
- McKinsey & Company. mckinsey.com
- NF Environment Ecolabel. marque-nf.com/nf-environnement
- Nordic Swan Ecolabel. nordic-ecolabel.org
- PEFC (Programme for the Endorsement of Forest Certification). pefc.org
- PROCURA+ European Sustainable Procurement Network. procuraplus.org
- Spanish Ministry for Ecological Transition. miteco.gob.es
- Valdelia. valdelia.org
- WRAP. wrap.org.uk

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