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

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Prezentul raport a fost elaborat de echipa tehnică de proiect CENFIM SAWYER, formată din:
Massimiliano Rumignani
Julio Rodrigo Fuentes
Joaquim Solana Monleón
Cu colaborarea experților externi menționați în continuare:
Juan Carlos Alonso
Jeroen Doom
Ellen Schmitz-Felten

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Partener principal:

Parteneri:

Organizație asociată:

Asociații naționale colaboratoare:

Mulțumiri

Dorim să le mulțumim colegilor noștri din cadrul partenerilor SAWYER Chiara Terraneo, Nicolas Sangalli, Omar Degoli, Paolo Chini – FederlegnoArredo, Rolf Gehring – EFBWW, Gabriella Kemendi, Giorgia Murgia – EFIC, precum și din cadrul organizației asociate, David Pavlis – UEA. Aceștia ne-au oferit informații relevante și expertiza lor, pe care le-am folosit ca surse de inspirație și sprijin în cercetarea noastră.

Suntem recunoscători responsabilului nostru de proiect din Comisia Europeană, Danny Scheerlinck, pentru că ne-a sprijinit pe parcursul întregului proces.

Recunoaștem aporturile cheie ale experților noștri externi Juan Carlos Alonso (Economie circulară), Jeroen Doom (Educație și Formare Profesională (EFP)) și Ellen Schmitz-Felten (Sănătate și Securitate în Muncă (SSM)).

Dorim, de asemenea, să le mulțumim și tuturor participanților la sondajul și atelierul SAWYER pentru că, prin contribuțiile variate și multidisciplinare, au făcut posibilă construirea unei noi viziuni și prognoze ample asupra sectorului mobilei în anul 2030, raportat la sectorul Economiei circulare și Dubla tranziție. În afară de cei menționați anterior, au mai contribuit: 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.

Dorim să mulțumim și asociațiilor naționale din sectorul mobilei care, în plus față de rolul asumat ca parteneri în proiect, au realizat o analiză a stadiului actual al tranziției către Economia circulară în țările lor:

- APMR – Asociația Producătorilor de Mobilă din România/România
- BBCWFI – Camera de Afaceri Bulgară pentru Prelucrarea Lemnului și Industria Mobilei/Bulgaria
- CBM – Asociația Profesională pentru Amenajări Interioare și Industria Mobilei/Olanda
- FCBA – Institutul pentru Tehnologia Sectoarelor Forestier și al Mobilei/Franța
- GS – Uniunea Lucrătorilor din Sectoarele Silvicultură, Lemn și Grafică din Suedia/Suedia

Derularea proiectului SAWYER a fost posibilă doar mulțumită finanțării primite în cadrul apelului de propuneri de proiecte pentru dialogul social al CE, VP/2018/001.

Index

Cuprins

Listă tabelelor

Listă figurilor

Rezumat

Dubla tranziție (ecologică și digitală) va avea un impact uriaș asupra sectorului mobilei din UE în anii și deceniile care vor urma. Noua Strategie Industrială Europeană, Pactul ecologic European și noul Plan de Acțiune pentru Economia Circulară vor juca un rol important în tranziția industrială a UE. Proiectul SAWYER, bazându-și analiza pe rezultatele proiectului DIGIT-FUR, care s-a axat pe impactul digitalizării în sector până în anul 2025, a urmărit să **analizeze instrumentelecheie/factorii determinanți ai tranziției** către o **economie mai circulară** în **Sectorul mobilier din UE până în anul 2030**, precum și să **anticipeze înțelegerea acestor transformări**. Acest lucru va oferi informații de perspectivă utile **tuturor partenerilor sociali și părților interesate din sector** despre modul în care sectorul, modelele de afaceri și lucrătorii săi vor fi afectați de această tranziție de-a lungul întregului lanț valoric până în anul 2030.

Proiectul a fost implementat împreună cu **mai mulți parteneri (CEN-FIM, EFBWW, EFIC, FLA,** și **UEA)** și alte entități naționale (APMR, BBCWFI, CBM, FCBA și GS), toți deținând o experiență îndelungată și solidă în sectorul mobilei. Mai mult, și alți **experți individuali** în economia circulară, sistemul EFP al UE, riscurile SSM și sectorul mobilei în sine și-au pus la dispoziție expertiza și și-au adus aportul pe toată durata implementării proiectului.

Proiectul SAWYER a fost implementat urmând o **metodologie de cercetare progresivă**. Inițial, au fost identificate principalele instrumente legislative și voluntare, precum și alte politici și strategii cu impact asupra tranziției sectorul mobilei din UE către o economie mai circulară. Pornind de la acestea, au fost prognozate 49 de evoluții ale acestor instrumente și politici, iar probabilitatea de materializare și impactul acestora au fost evaluate într-un **sondaj on-line** cu 51 de experți din 15 țări. Evoluțiile prognozate au fost analizate și definitivate în cadrul unui **atelier de lucru** care a adus laolaltă 20 de experți. Rezultatele au fost utilizate pentru a prognoza scenariul pentru anul 2030 în sectorului mobilei din UE, în contextul economiei circulare.

Acest scenariu, pornind de la rezultatele proiectului DIGIT-FUR și adaptând **cadrul ReSOLVE** la sectorul mobilei, a permis identificarea **modificărilor prognozate la nivelul sarcinilor aferente unui număr de unsprezece profiluri ocupaționalechie** în contextul tranziției sectorului către o economie mai circulară și al digitalizării sectorului. Apoi, au fost identificate noile **riscuri de securitate și sănătate în muncă** și modificările **în ce privește necesarul de abilități, cunoștințe și competențe**.

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Principalele rezultate ale cercetării sunt sintetizate în continuare, începând cu viziunea proiectului SAWYER, care afirmă:

Până în 2030, cu un **sector al mobilei în cea mai mare parte digitalizat**, industria producătoare de mobilă pe bază de lemn va oferi **produse și servicii concepute cu grijă pentru mediu**, realizate din **materii prime cu impact redus și trasabile și aplicând procese de fabricație sustenabile**, promovând în același timp și **cele mai bune scenarii de utilizare și recuperare** a materialelor și produselor scoase din uz. Clienții (persoane juridice (B2B) sau persoane fizice (B2C)) vor solicita informații mai detaliate despre produse și **caracteristicile care privesc sustenabilitatea** ale acestora, inclusiv indicatori specifici ciclului de viață, iar capacitatea consumatorilor de a-și impune punctul de vedere va fi cheia atingerii cu succes a obiectivelor de circularitate. Autoritățile (la nivel local, național și european) vor facilita circularitatea stimulând **scenarii durabile pentru expirarea sau scoaterea din uz** a materialelor și produselor pe bază de lemn, extinzând **schemele de achiziții publice și private ecologice** și promovând **politici pentru o utilizare mai eficientă a materialelor**.

În acest scenariu, **Instrumente digitale** vor fi utilizate masiv în sector atât de IMM-uri, cât și de întreprinderile mari, de-a lungul întregului lor lanț valoric. Aceste instrumente digitale vor promova o economie mai circulară, **eficientizând procesele de fabricație** și facilitând **trasabilitatea** substanțelor, materialelor și produselor. Clienții vor fi mai bine informați despre **caracteristicile care privesc sustenabilitatea** ale produselor, iar **comerțul electronic cu produse de mobilier va crește**, provocând transformări în activitățile de marketing și relații cu clienții, dar și în vânzări și aspectele logistice conexe. Acest cadru va permite unui număr tot mai mare de producători de mobilă să implementeze, de-a lungul **întregului lanț valoric** din care fac parte, diferite practici de economie circulară, crescând astfel sustenabilitatea propriilor sisteme de management și producție. Exigențele sociale și legislative impuse companiilor în legătură cu reducerea **amprentei de mediu** și implicarea în contracararea schimbărilor climatice actuale vor fi din ce în ce mai mari. Circularitatea în acest sector este în stadii incipiente, iar rezultatele vor fi observate pe termen mediu și lung.

Dubla tranziție în industria mobilei ridică **noi provocări pentru sănătatea și securitatea în muncă. Noile tipuri de locuri de muncă, noile procese, noile tehnologii** și **noile materiale/produse** pot afecta securitatea și sănătatea lucrătorilor, însă, cu sprijinul unei planificări și implementări riguroase, **sănătatea și securitatea lucrătorilor pot fi considerabil îmbunătățite**. Din acest motiv, trebuie să ne asigurăm că nici această tranziție, nici noile tehnologii sau procese de lucru pe care le propune nu vin la pachet cu noi pericole (riscuri). **Economia circulară în acest sector**, acordând aceeași atenție și aspectelor SSM și celor de mediu, trebuie **implementată prin mașini, procese de lucru și materiale mai sigure și mai eficiente**, capabile să reducă riscurile chimice și fizice pentru lucrători. Aplicarea conceptelor privind **proiectarea ecologică** a produselor trebuie să faciliteze operațiunile de recuperare și reparare, reducând riscurile care țin de ergonomie, dar și să diminueze conținutul de substanțe periculoase și, implicit, riscurile chimice de-a lungul întregului lanț valoric. Securitatea și sănătatea lucrătorilor ar putea fi îmbunătățite prin integrarea principiilor gestionării SSM în sistemele de management al calității implementate de companii.

Pentru anumite profiluri ale posturilor, vor fi necesare **noi seturi de competențe ecologice** în contextul unor sarcini noi, specifice, legate de dezasamblare și reutilizare, re-fabricare, reciclare și reciclare superioară. Aceste noi seturi de competențe sunt în mod particular (mai) importante pentru sarcinile asociate profilurilor „cu caracter practic". Ele vor avea și un impact, deși nu la fel de semnificativ, asupra acelor profiluri care gestionează și iau decizii strategice în cadrul companiilor. În plus, **abilitățile, cunoștințele și competențele ecologice generice** au fost considerate necesare pentru dezvoltarea socială, economică și ecologică a sectorului mobilierului din lemn. Aceste competențe ecologice generice sunt aliniate competențelor cheie sau aptitudinilor social-culturale, care au fost contextualizate din perspectiva conștientizării aspectelor de mediul și a înțelegerii dezvoltării durabile și a economiei circulare.

Rezultatele proiectului vor facilita și susține dialogul social între actorii cheie din sector și părțile interesate și le vor permite acestora să ofere sprijinul necesar Dublei tranziții în sectorul mobilei și să facă față provocărilor din anii următori, precum și să **asigure capacitatea de ocupare și siguranța lucrătorilor, dar și competitivitatea companiilor**.

▲ ACCESAȚI INDEXUL

Introducere

Obiective

Obiectivul general al proiectului SAWYER a fost reprezentat de înțelegerea și previzionarea modului în care sectorul mobilei din UE va fi afectat de tranziția la economia circulară și de furnizarea de informații de perspectivă utile pentru toți partenerii sociali și părțile interesate din sector despre modul în care sectorul, modelele de afaceri și lucrătorii săi vor fi afectați de această tranziție de-a lungul întregului lanț valoric până în anul 2030. Pe durata implementării proiectului, partenerii au observat că această tranziție la economia circulară se dovedește strâns legată de digitalizarea sectorului și au decis să pornească analiza rde la rezultatele obținute în proiectul anterior DIGIT-FUR, care a previzionat impactul digitalizării sectorului în perspectiva anului 2025. În concluzie, rezultatul cheie al proiectului SAWYER este reprezentat de o prognoză a **impactului dublei tranziții (ecologice și digitale) asupra sectorului mobilei din UE**, în general, în ceea ce privește modelele de activitate adoptate în sector, asigurarea EFP și riscurile SSM, și în particular, asupra a unsprezece profiluri profesionale cheie.

Această prognoză a dublei tranziții va ajuta părțile interesate din sector **să anticipeze schimbările** necesare pentru a îmbunătăți și actualiza competențele lucrătorilor și siguranța acestora la locul de muncă și, în consecință, a asigura competitivitatea companiilor producătoare de mobilă din UE în anii sau chiar deceniile care urmează.

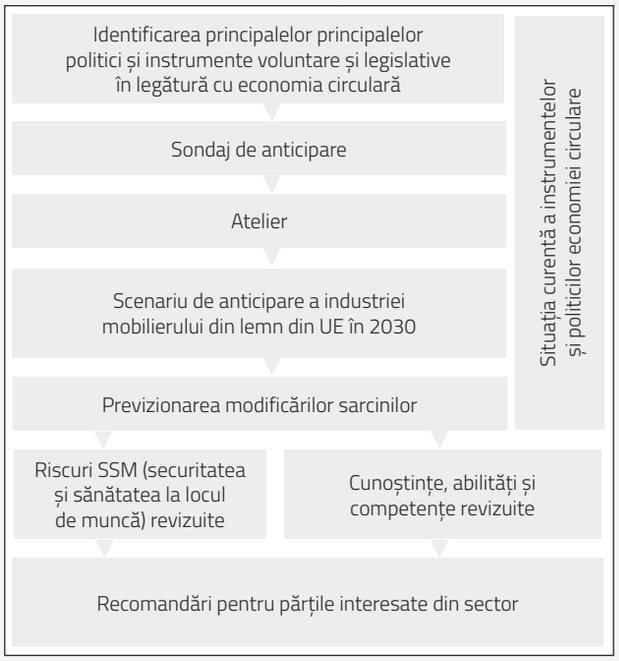
Obiectivele specifice ale SAWYER au fost:

- Înțelegerea **situației actuale și a tendințelor** în sectorul mobilei din UE din perspectiva instrumentelor legislative și voluntare ale economiei circulare.
- Definirea unui **posibil scenariu sectorial viitor în perspectiva anului 2030** în contextul tranziției acestuia la economia circulară.
- Identificarea **efectelor** acestui scenariu **asupra sarcinilor asociate profilurilor ocupaționale cheie din sector, riscurilor SSM și necesarului de competențe și cunoștințe.**
- Prognozarea unui **set de așteptări realiste pentru părțile interesate din sector** în urma acestor schimbări și definirea de modalități de a le face față.
- Sprijinirea eforturilor asociate **Dialogului social european** și îmbunătățirea relațiilor industriale la nivel european.
- **Cartografierea inițiativelor de succes** care pot sprijini părțile interesate în implementarea proceselor economiei circulare.

Metodologie

Metodologia de cercetare adoptată de parteneriat (Figura 1) a fost conceput de echipa SAWYER a CENFIM (M. Rumignani, J. Rodrigo, J. Solana) și de expertul extern în economie circulară al proiectului, Juan Carlos Alonso, și a fost implementată cu sprijinul a celorlalți parteneri SAWYER (FLA, EFBWW, EFIC și UEA) și al celorlalți doi experți externi ai proiectului, Jeroen Doom (sistemul de EFP) și Ellen Schmitz-Felten (riscurile SSM). Studiul a demarat cu identificarea **principalelor instrumente legislative și voluntare și a altor politici și strategii** care poate avea impact asupra tranziției sectorului mobilei din UE către o economie mai circulară.

Figura 1.- Schema privind metodologia proiectului



Pentru a fundamenta această analiză, a fost elaborat un raport specific asupra **situației curente a acestor instrumente și politici** la nivel european și în șapte țări membre UE (Spania, Italia, Franța, Olanda, România, Bulgaria și Suedia). Pe baza acestui raport, au fost prognozate 49 de evoluții ale acestor instrumente și politici, iar probabilitatea de materializare și impactul acestora au fost evaluate într-un **sondaj on-line**, care a implicat 50 de profesioniști din 15 state membre UE, experți în economie circulară și/sau sectorul mobilei.

Odată ce rezultatele sondajului au fost colectate, prelucrate și sintetizate, cele 49 de evoluții prognozate au fost analizate și ajustate în cadrul unui **atelier de lucru** care a adus laolaltă 20 de profesioniști din 9 state membre UE, cu diferite expertize, de la sectorul mobilei și proiectare ecologică la instrumentele legislative și voluntare specifice economiei circulare. Ca rezultat final al acestui proces, **a fost elaborat raportul „Scenariul prognozat pentru sectorul mobilei din perspectiva economiei circulare în perspectiva anului 2030”**. Acesta prognozează starea sectorului mobilei în UE în perspectiva anului 2030, pe baza scenariului prognozat pentru anul 2025 în proiectul anterior DIGIT-FUR, care a analizat impactul digitalizării asupra sectorului. Rezultatul a fost reprezentat de o prognoză și o analiză a impactului **Dublei tranziții (ecologice și digitale)** asupra sectorul mobilei din UE în următorii ani și decenii.

Pe baza acestor rezultate, expertul în economie circulară al proiectului, în colaborare cu echipa de proiect SAWYER a CENFIM și pe baza rezultatelor proiectului anterior DIGIT-FUR, a identificat **schimbările preconizate în sarcinile a unsprezece profiluri profesionale cheie** datorită tranziției sectorului către o economie mai circulară și digitalizării sectorului. Analiza a fost implementată după o adaptare corespunzătoare a **cadrului ReSOLVE**, dezvoltat de Centrul McKinsey și Fundația Ellen MacArthur, la sectorul mobilei. Astfel, noile tabele de previzionare includ rezultatele preconizate ale dublei tranziții (ecologice și digitale) în sectorul mobilei, oferind o imagine clară asupra sarcinilor viitoare așteptate pentru toate cele unsprezece profiluri ocupaționale.

Următorul pas a fost analiza **Pericolelor SSM și a modificărilor riscurilor**, curente și preconizate, în urma digitalizării sectorului și tranziției la economia circulară, având în vedere reformularea sarcinilor realizată în analiza anterioară pentru diferitele profiluri ocupaționale. În această analiză, diferitele tipuri de pericole cu care se pot confrunta lucrătorii din fabricile de mobilă din lemn au fost grupate după diferite categorii de riscuri.

Ultimul pas a fost reprezentat de analiza modului în care **nevoile de cunoștințe, abilități și competențe** din prezent ale lucrătorilor și companiilor se pot modifica sub imperiul digitalizării sectorului (până în anul 2025) și al economiei circulare (până în anul 2030) pentru cele unsprezece profiluri ocupaționale cheie, luând în considerare „principalele cauze/motive ale schimbării", din perspectiva digitalizării și a economiei circulare și analizând dacă vor continua să fie necesare sau nu. Această analiză permite identificarea nevoilor de cunoștințe, abilități și competențe care vor suferi modificări, dar și a noilor competențe care vor fi necesare în noua economie circulară în companiile din sector care doresc să se adapteze și să valorifice în mod corespunzător oportunitățile oferite de circularitatea la creșterea sectorului.

Pe baza unei analize și aprofundări suplimentare a tuturor acestor rezultate, experții și parteneriatul SAWYER au venit cu un set de **recomandări** pentru părțile interesate din sectorul mobilei, în general, și pentru decidenții politici, furnizorii de EFP și entitățile de reglementare, în special.

Un exercițiu de cartografiere a **Inițiativelor europene** care facilitează și susțin tranziția industriilor comunitare către o economie mai circulară a oferit informații despre diferite inițiative relevante la nivel național și regional.

Principalele 11 profiluri ocupaționale selectate și analizate din clasificarea ESCO (Clasificarea europeană a aptitudinilor/competențelor, calificărilor și ocupațiilor), cu codul de identificare ISCO aferent:

1221 Manageri de vânzări și marketing
1321 Manager de producție industrială
1324 Manager al lanțului de aprovizionare (Manageri de aprovizionare, de distribuție și similari)
2141 Inginer de întreținere și reparații (lucrători de întreținere și reparații mașini)
2163 Designeri de mobilier (Designeri de produs și articole de îmbrăcăminte)
7522 Tâmplari și lucrători similari
7523 Operatori și reglori de mașini-unelte pentru prelucrarea lemnului
7534 Tapițeri și lucrători similari
8172 Operatori utilaje de prelucrare a lemnului
8219 Montator de mobilier
9329 Muncitor de fabrică

Rezultate

Stadiul actual al economiei circulare în sectorul mobilei din EU

Zona de analiză în proiectul SAWYER a fost sectorul mobilei care, conform clasificării NACE Rev. 2, acoperă codul 31.0 (Fabricarea de mobilă). Acesta înregistrează o cifră de afaceri de 110,4 miliarde euro și o valoare adăugată de 32% (conform celor mai recente date EUROSTAT din 2018), ceea ce îl face un sector foarte relevant pentru economia UE, inclusiv datorită celor 1.043.806 lucrători în sector (EUROSTAT, 2018) . Sectorul mobilei în UE28 este format în mare parte din companii de dimensiune micro, mică și mijlocie, după cum se indică în tabelul următor.

Tabelul care urmează prezintă date cu privire la lucrătorii din sector în legătură cu principalele categorii de funcții ale posturilor și profilurile analizate în proiectul SAWYER.

Tabelul 1.- Numărul de lucrători în principalele categorii din Sectorul mobilei al UE în anul 2018.

Categorii după funcția la locul de muncă[1]	Volum aprox. în anul 2018, 1.043.806 lucrători[2]	Profiluri profesionale vizate de proiectul SAWYER (profiluri profesionale conform ISCO)
Manageri	80.395	Nu sunt vizați în acest studiu
Profesioniști TIC	11.485	Nu sunt vizați în acest studiu
Designeri	10.818	Codurile 2163 Designer de mobilier
Manager de producție	22.970	Codurile 1321 Manager de producție industrială
Personal de vânzări și marketing	22.970	1221 Manageri de vânzări și marketing + profiluri suplimentare care nu sunt vizate în acest studiu
Manageri ai lanțului de aprovizionare	10.818	Codurile 1324 Manager al lanțului de aprovizionare
Personal administrativ	114.851	Nu sunt vizați în acest studiu
Lucrători întreținere și reparații echipamente și mașini	68.910	Codurile 2141 Inginer de întreținere și reparații + profiluri suplimentare care nu au făcut obiectul acestui studiu
Meșteșugari calificați (tâmplari și tapițeri)	574.255	7522 Tâmplari și lucrători similari
		7534 Tapițeri și lucrători similari
		Codurile 8219 Montatori de mobilier
Operatori de mașini	45.941	7523 Operatori și reglori de mașini-unelte pentru prelucrarea lemnului
		8172 Operatori utilaje de prelucrare a lemnului
Muncitori necalificați	80.395	9329 Muncitor necalificat

[1]Categorii după funcția la postul de lucru din studiul TNO, ZSI, SEOR (2009), CE.
[2]Pe baza prelucrării datelor EUROSTAT cu privire la numărul total de lucrători din sectorul mobilei în UE28.

În urma identificării unui set de **instrumente legislative și voluntare importante** și a altor **politici** și strategii cu impact asupra **tranziției sectorului mobilei din UE către o economie mai circulară**, a fost realizată o analiză detaliată a gradului lor de implementare.

În primul raport al proiectului „Situația curentă a economiei circulare în sectorul mobilei", elaborat până în luna noiembrie 2019, parteneriatul a realizat o analiză detaliată a tuturor acestor elemente și a gradului lor de implementare, atât la nivelul UE, cât și în mod specific în anumite state membre UE (Franța, Italia, Spania, România, Olanda, Suedia și Bulgaria). Aceste cunoștințe conexe sunt considerate necesare de către parteneriat pentru a înțelege și a previziona în mod corespunzător evoluția economiei circulare în sector.

Instrumentele selectate au fost grupate în trei categorii diferite: instrumente legislative și voluntare și alte politici și strategii. Descrierea lor detaliată și rezultatele analizei acestora au fost consemnate în trei documente de sine-stătătoare:

- Situația curentă a economiei circulare în sectorul mobilei la nivelul UE
- Situația curentă a economiei circulare în sectorul mobilei în 7 state membre UE
- Tabel sintetic: Actualizare a Situației curente a economiei circulare la nivelul UE

Toate aceste documente pot fi descărcate de pe site-ul web al proiectului SAWYER: circularfurniture-sawyer.eu/downloads

Tabelul care urmează include lista instrumentelor și politicilor selectate și gradul estimat de implementare a acestora la nivelul UE, pe o scară de la 1 la 5 (1 = valoarea minimă și 5 = valoarea maximă).

Tabelul 2.- Lista instrumentelor și politicilor selectate și gradul de implementare a acestora la nivelul UE

Instrument	Descriere	Grad de implementare
Instrumente legislative		
Pachetul privind economia circulară al CE	Planul de acțiune pentru economia circulară (COM (2015) 614) își propune să stimuleze implementarea Economiei circulare în Europa. Acesta prevede revizuirea anumitor reglementări (de exemplu, cadrul privind deșeurile) și alte acțiuni de promovare a circularității (de exemplu, strategia privind plasticul).	**5** Toate cele 54 de măsuri propuse au fost deja finalizate sau sunt în faza de implementare {SWD (2019) 90 final}.
Pactul ecologic European	Pactul ecologic European (COM (2019) 640 final și Anexă) este foaia de parcurs a UE pentru o economie a UE mai durabilă, cu măsuri dedicate: • stimulării utilizării eficiente a resurselor făcând trecerea la o economie curată și circulară • restabilirii biodiversității și reducerii poluării • Obiectivul este ca UE să devină neutră din punct de vedere climatic până în anul 2050, făcând tranziția justă și incluzivă pentru toți. Acest demers va necesita eforturi din partea tuturor sectoarelor economiei UE, inclusiv: • investiții în tehnologii ecologice • sprijinirea industriei pentru a inova • implementarea unor forme de transport privat și public mai curate, mai ieftine și mai sănătoase • decarbonizarea sectorului energetic • clădiri mai eficiente din punct de vedere energetic • colaborarea cu partenerii internaționali pentru îmbunătățirea standardelor globale de mediu	**2** În punctul său 2.1.3. Mobilizarea industriei pentru o economie curată și circulară, acesta anunță faptul că CE va adopta o strategie industrială a UE și va publica un nou plan de măsuri pentru economia circulară, ca piloni ai Pactului Ecologic al UE (realizat în luna martie 2020). Anexa la Comunicarea privind Pactul ecologic European definește foaia de parcurs și Măsurile cheie pentru perioada 2019-2021. Aceste măsuri cheie sunt clasificate pe următoarele coordonate: • Ambiția în domeniul climei • Energie curată, accesibilă și sigură • Strategia industrială pentru o economie curată și circulară • Mobilitate durabilă și inteligentă • Ecologizarea politicii agricole comune/ Strategia de „De la fermă la consumator" • Conservarea și protejarea biodiversității • Către obiectivul zero poluare pentru un mediu fără substanțe toxice • Standardizarea sustenabilității ca tendință dominantă în toate politicile UE • UE, ca lider global • Lucrând împreună – un Pact european privind clima
Noul Plan de acțiune pentru economia circulară pentru o Europă mai curată și mai competitivă	Noul Plan de acțiune pentru economia circulară (COM (2020) 98 final și Anexă) anunță inițiative de-a lungul întregului ciclu de viață al produselor, vizând, de exemplu, modul de proiectare a acestora, promovarea proceselor economiei circulare, încurajarea consumului durabil și asigurarea faptului că resursele utilizate sunt păstrate în economia UE cât mai mult timp cu putință.	**1** În Anexa sa, Planul include un calendar pentru inițiativele propuse, în perioada 2020-2023. Principalele măsuri sunt clasificate pe următoarele coordonate: • Un cadru de politici privind produsele sustenabile • Lanțurile valorice cheie ale produselor • Mai puține deșeuri, mai multă valoare • O circularitatea funcțională pentru oameni, regiuni și orașe • Acțiuni transversale • Coordonarea eforturilor la nivel global • Monitorizarea progresului
Directiva privind deșeurile de echipamente electrice și electronice (DEEE)	Directiva 2012/19/UE impune instituirea unor scheme de colectare (gratuite pentru consumatori) pentru a crește gradul de reutilizare și/sau reciclare a DEEE.	**5** Fosta directivă DEEE a intrat în vigoare în anul 2003. În anul 2017, Comisia a adoptat „pachetul DEEE", iar în anul 2018, un raport final privind eforturile de promovare a conformității DEEE a examinat gradul de implementare în fiecare stat membru UE.
Restricționarea utilizării substanțelor periculoase în echipamentele electrice și electronice (RuSP)	Directiva 2011/65/UE a fost modificată prin Directiva (UE) 2017/2102, care a revizuit domeniul de aplicare pentru unele grupe de produse și a facilitat încurajarea unei economii mai circulare în Uniune prin promovarea operațiunilor de pe piață secundară pentru EEE, care presupun reparații, înlocuirea pieselor de schimb, recondiționarea și reutilizarea, precum și post-echiparea.	**5** Fosta directivă RuSP a intrat în vigoare în anul 2003. A fost revizuită de mai multe ori pentru a modifica excepțiile și termenele limită impuse acestora.
Directiva privind produsele cu impact energetic (ErP sau proiectare a ecologică)	Directiva 2009/125/CE reprezintă cadrul pentru definirea cerințelor de proiectare ecologică pentru produsele care utilizează energie sau care au un impact energetic (adică, deși nu consumă energie direct, pot genera un consum suplimentar de energie, cum ar fi ferestrele).	**4** CE publică Planuri de lucru pentru a identifica grupele de produse prioritare și strategiile viitoare. Cel mai recent plan de lucru acoperă perioada 2016-2019 și acordă o atenție sporită eficienței resurselor, analizând posibila aplicare de cerințe suplimentare „specifice produsului" cu privire la anumite aspecte, cum ar fi sustenabilitatea etc.
Responsabilitatea extinsă a producătorilor (REP)	Responsabilitatea extinsă a producătorilor (REP) reprezintă „o abordare a politicii de mediu în care responsabilitatea unui producător pentru un produs este extinsă la etapa post-consum a ciclului de viață al unui produs".	**4** Directivele existente la nivelul UE pentru anumite produse specifice (DEEE, baterii, vehicule scoase din uz, ambalaje etc.). La nivel național, scheme REP pentru alte produse.

Instrument	Descriere	Grad de implementare
Regulamentul privind substanțele periculoase/ REACH	Regulamentul REACH (CE 1907/2006) are ca obiectiv îmbunătățirea protejării sănătății oamenilor și a mediului prin identificarea proprietăților periculoase ale substanțelor chimice utilizate în UE. Atât producătorii, cât și importatorii au responsabilitatea de a colecta informații cu privire la proprietățile specifice și critice ale substanțelor chimice pe care le utilizează.	**3** Deși Regulamentul REACH este pe deplin operațional, implementarea lui nu este la nivelul așteptărilor inițiale. Printre problemele identificate se numără, și, lipsa de informații conforme din dosarele de înregistrare sau necesitatea simplificării procesului de autorizare.
Emisiile de formaldehidă	Formaldehida produsă și importată la nivel european este utilizată în principal pentru fabricarea rășinilor utilizate la realizarea panourilor din lemn. Expunerea la emisiile de formaldehidă este o problemă importantă pentru consumatori (emisiile din articole) și pentru lucrători (expunerea ocupațională).	**2** La nivel european, nu există o cerință legislativă comună, însă există un acord sectorial voluntar al membrilor Federației Europene a Panourilor (FEP), care produc numai panouri pe bază de lemn de clasa E1. Unele state membre UE au adoptat legislație națională în acest sens.
Normele UE privind criteriile de încadrare a materialelor în categoria deșeuri sfârșitul ciclului de viață	Directiva-cadru privind deșeurile 2008/98/CE prevede faptul că anumite deșeuri vor înceta să fie considerate deșeuri normale dacă au fost supuse unui proces de recuperare (inclusiv reciclare) și dacă respectă criterii specifice elaborate în conformitate cu anumite condiții legale. Obiectivul este eliminarea poverii administrative impuse de legislația privind deșeurile pentru deșeurile de materiale sigure și de înaltă calitate, pentru a stimula reciclarea acestora.	**3** La nivel european, criteriile au fost definite pentru 8 tipuri de deșeuri, însă există reglementări specifice pentru deșeurile de fier, oțel, cupru și aluminiu și pentru cioburile de sticlă.
Substanțe ignifuge	Unele produse de mobilier utilizează substanțe ignifuge pentru a respecta multitudinea de standarde privind inflamabilitatea obiectelor de mobilier. Unele dintre aceste standarde impun respectarea testelor cu flacără deschisă, forțând utilizarea substanțelor ignifuge. Unele tipuri de substanțe utilizate ca agenți ignifugi sunt reglementate de Regulamentul (UE) 2019/1021, care reformează Regulamentul (CE) 850/2004 privind poluanții organici persistenți (POP).	**3** Utilizarea substanțelor ignifuge nu este reglementată direct la nivel european. Indirect, aceasta este reglementată în cazul în care substanțele utilizate sunt considerate periculoase (de exemplu, prin Regulamentul REACH sau Regulamentul POP). Reglementările specificate sunt bine implementate și noi substanțele sunt actualmente în studiu.
Directiva privind energia regenerabilă (DER II)	În luna decembrie 2018, a intrat în vigoare directiva revizuită privind energia regenerabilă 2018/2001/ UE, ca parte a pachetului Energie curată pentru toți europenii. Aceasta stabilește un nou obiectiv obligatoriu pentru UE în ceea ce privește energia regenerabilă pentru UE în perspectiva anului 2030, și anume de cel puțin 32%, cu o clauză pentru o posibilă revizuire ascendentă până în anul 2023. Directiva privind energia regenerabilă stabilește criteriile de sustenabilitate pentru toți biocombustibilii produși sau consumați în UE.	**4** Directiva este implementată și sunt avute în vedere obiective chiar și mai ambițioase pentru energia regenerabilă. În ceea ce privește sustenabilitatea biocombustibililor, companiile își pot demonstra conformitatea cu criteriile de sustenabilitate prin sisteme naționale sau așa-numitele scheme voluntare recunoscute de Comisia Europeană.
Exploatarea forestieră ilegală și comerțul ilegal cu cherestea	Regulamentul (UE) nr. 995/2010 definește obligațiile operatorilor care vând sau distribuie cherestea și produse din lemn. Este cunoscut sub denumirea de Regulamentul privind cheresteaua al UE sau EUTR, ca parte a Planului de acțiune al UE cu privire la aplicarea legislației în domeniul forestier, guvernanța și schimburile comerciale cu produse din lemn (FLEGT). O altă schemă este reprezentată de Convenția privind comerțul internațional cu specii cu specii pe cale de dispariție din fauna și flora sălbatice (CITES).	**5** Aceste reglementări și planuri de măsuri sunt implementate la nivel european și internațional. Sunt publicate noi planuri de acțiune pentru protejarea pădurilor, de exemplu COM (2019) 352, final, cu privire la „Intensificarea eforturilor UE pentru protejarea și refacerea pădurilor lumii", care propune crearea unui Observator al UE privind defrișările și degradarea pădurilor.
Instrumente voluntare		
Achiziții publice ecologice (APE)	Achizițiile publice ecologice încorporează criterii de mediu în caietele de sarcini ale licitațiilor publice, cu scopul de a integra componentele de mediu în deciziile de achiziții publice. Aceste criterii de mediu pot să acopere diferite aspecte ale produselor pe parcursul ciclului lor de viață. APE pot stimula crearea unei mase critice a cererii de bunuri și servicii mai sustenabile, care altfel nu ar fi ușor de obținut pe piață	**3** Gradul efectiv de implementare diferă de la un stat membru UE la altul. Comisia Europeană și mai multe state membre UE au elaborat diferite orientări pentru procesele APE, sub forma unor criterii naționale APE. Principalele provocări se referă la asigurarea unor cerințe APE compatibile între diferite state membre UE și încurajarea mai multor organisme din sectorul public să adopte aceste criterii.
Managementul mediului în organizații	Un sistem de management al mediului (SMM) poate ajuta organizațiile să identifice, gestioneze, monitorizeze și controleze aspectele de mediu specifice într-o manieră „holistică". La nivel european, există două sisteme principale de management al mediului certificate, și anume EMAS și ISO-14001:2015.	**4** Au fost publicate diferite revizuiri ale schemelor ISO și EMAS. Acestea sunt scheme consolidate, dar implementate parțial în sectorul afacerilor. La nivelul UE, 3.728 de organizații sunt certificate în conformitate cu EMAS (aprilie 2019), iar 111.133 în conformitate cu ISO 14001 (2017).

Instrument	Descriere	Grad de implementare
Metodologia privind proiectarea ecologică	Proiectarea ecologică este definită ca „integrarea aspectelor de mediu în proiectarea și dezvoltarea produselor cu scopul de a reduce impactul negativ asupra mediului pe parcursul întregului ciclu de viață al unui produs". Standardul UNE-EN ISO 14006: 2020 oferă îndrumări care să ajute organizațiile în stabilirea, documentarea, implementarea, menținerea și îmbunătățirea continuă a propriilor sisteme de proiectare ecologică, ca parte a unui SMM. Există și alte standarde care tratează proiectarea ecologică, cum ar fi UNE-ISO/ TR 14062: 2007 sau IEC 62430:2019	**3** Ultima revizuire a ISO 14006 s-a realizat în anul 2020. Standardul precizează că nu este elaborat în scop de certificare, ceea ce îngreunează cunoașterea nivelului efectiv de implementare pe piață. În orice caz, se presupune că gradul său de implementare este semnificativ inferior ISO-14001.
Etichetele ecologice (Tip I, II și III)	Etichetele ecologice încearcă să ofere clienților informații despre caracteristicile ecologice ale unui produs. Există un volum uriaș de etichete ecologice diferite, însă toate ar putea fi incluse în trei tipuri principale de etichete ecologice (adică I, II și III) și sunt reglementate în conformitate cu standardul ISO 14020.	**4** Diferitele sisteme de etichetare ecologică sunt bine dezvoltate și sunt utilizate pe scară largă pentru anumite tipuri de produse (de exemplu, bunuri de larg consum). Cu toate acestea, sunt necesare eforturi suplimentare pentru a informa mai bine consumatorul despre semnificația reală a acestor etichete ecologice, pentru a evita orice înțelegere greșită.
Certificarea lanțului de custodie (FSC/PEFC)	Certificarea Lanțului de custodie pentru aprovizionarea cu cherestea furnizează dovezi că produsul certificat provine din păduri certificate, bine gestionate. Aceasta cerificare verifică și asigură că aceste produse nu sunt amestecate cu alte produse din păduri necertificate în niciun punct de-a lungul lanțului de aprovizionare, decât în baza unor controale stricte, când se utilizează etichetarea procentuală (%). În prezent, în industria lemnului, există două programe acreditate independent privind lanțul de custodie: Schemele FSC (Forest Stewardship Council – Consiliul de Administrare a Pădurilor) și PEFC (Programme for the Endorsement of Forest Certification – Programul pentru Aprobarea Certificării Forestiere).	**5** Aceste două scheme sunt bine dezvoltate, iar cererea de certificare a lanțului de custodie a crescut dramatic în ultimii trei ani, în condițiile în care, pentru multe companii, posibilitatea de a demonstra că un produs din lemn a provenit dintr-o sursă bine gestionată este acum un factor cheie în specificațiile produselor din lemn și hârtie.
Certificare a clădirilor ecologice (BREEAM/LEED)	Există două scheme majore de certificare a clădirilor ecologice: Building Research Establishment's Environmental Assessment Method (BREEAM), care a fost primul sistem de evaluare a clădirilor ecologice dezvoltat în Marea Britanie, și Leadership in Energy and Environmental Design (LEED) dezvoltat mai recent în SUA de Green Building Council (USGBC).	**4** Aceste două scheme sunt bine implementate la nivelul UE. De exemplu, 19.542 de evaluări BREEAM sunt certificate în țările UE (majoritatea în Marea Britanie). iar 3.766 de proiecte au fost certificate în conformitate cu LEED. Deși există o cerere din ce în ce mai mare pentru acest tip de certificări, ele acoperă în continuare doar o mică parte din sectorul clădirilor.
Alte instrumente și politici		
Utilizarea în cascadă a lemnului	Utilizarea în cascadă a resurselor de biomasă, cum ar fi lemnul și produsele agricole, înseamnă o utilizare eficientă a acestor resurse din punctul de vedere al resurselor naturale, al materialelor și al consumului de terenuri. Conceptul acordă prioritate utilizărilor cu valoare mai mare care permit reutilizarea și reciclarea produselor și materiilor prime, promovând utilizarea energiei doar atunci când nu sunt fezabile alte opțiuni.	**2** Comisia Europeană a dat publicității două publicații relevante cu privire la această chestiune, inclusiv un Ghid privind utilizarea în cascadă a biomasei. Până în prezent, nu există alte cerințe asociate acestei teme.
Politica industrială a UE pentru silvicultură	Comisia UE a adoptat Strategia forestieră a UE în anul 2013 (COM (2013) 659 final) care urmărește să ajute pădurile și sectorul conex să facă față provocărilor actuale. Strategia oferă un cadru pentru a răspunde cerințelor tot mai mari impuse pădurilor și pentru a face față schimbărilor societale și politice. Strategia forestieră a UE 2014-2020 a fost dezvoltată pentru a oferi un cadru coerent atât pentru politicile UE legate de păduri, cât și pentru politicile forestiere naționale ale fiecărui stat membru UE.	**4** În 2018, Comisia a prezentat raportul „Progresul în implementarea strategiei forestiere a UE" (COM (2018) 811 final) care revizuiește această strategie. Ediția revizuită evidențiază faptul că strategia forestieră a UE își atinge obiectivul de a încuraja o gestionare mai durabilă a pădurilor la nivelul UE și la nivel mondial.
Planul privind industriile bazate pe exploatarea pădurii	În anul 2013, Comisia Europeană a publicat Planul privind industriile bazate pe exploatarea pădurii din UE (SWD (2013) 343 final). Acest document a însoțit Strategia forestieră a UE și evidențiază provocările pe care industriile bazate pe exploatarea pădurii trebuie să le depășească pentru a rămâne competitive.	**3** Au fost identificate unele măsuri care pot ajuta la depășirea acestor provocări în perioada 2014-2020. Un grup de organizații și-a prezentat viziunea strategică comună și agenda pentru industriile bazate pe exploatarea pădurii în perspectiva anului 2050.
Bioeconomia	Obiectivul bioeconomiei este o economie mai inovatoare și cu emisii reduse, care integrează exigențele cu privire la un sector al agriculturii și pescuitului sustenabile, securitate alimentară și utilizare durabilă a resurselor biologice regenerabile în scopuri industriale, susținând în același timp biodiversitatea și protecția mediului.	**3** Comisia Europeană a stabilit o Strategie și un plan de acțiune privind bioeconomia, publicate în anul 2012 și revizuite în anul 2018. Această actualizare a vizat un plan de acțiune care include 14 măsuri concrete avute în vedere pentru a fi lansate în anul 2019. De asemenea, Comisia lucrează la asigurarea unei abordări coerente a bioeconomiei prin diferite programe și instrumente (de exemplu, Orizont 2020, BBI etc.).

Anticipări: rezultate ale sondajului și atelierului

Următorii pași ai proiectului au fost organizarea unui **sondaj de previzionare online și a atelierului de lucru cu experții**. Sondajul a fost realizat cu 50 de profesioniști din 15 state membre UE și s-a sprijinit pe raportul privind situația curentă elaborat anterior. Experților în economie circulară și/sau sectorul mobilei li s-a solicitat să evalueze gradul de probabilitate și impactul celor 49 de evoluții prognozate până în anul 2030 și legate de instrumentele și politicile cu impact identificate anterior.

Obiectivele sondajului au fost:

- Identificarea **evoluțiilor care sunt mai probabil** să se materializeze până în anul **2030**.
- Elaborarea **primei versiuni a listei cu situațiile care vor avea cel mai mare impact asupra sectorului până în anul 2030**.

Rezultatele sondajului au permis clasificarea acestor 49 de evoluții prognozate raportat la **probabilitate** de materializare și relevanța **impactului** acestora din perspectiva tranziției sectorului către o economie mai circulară, arătând părților interesate din sector cărora dintre aceste instrumente ar trebui să li se acorde mai multă atenție pentru a face față în mod corespunzător provocărilor prezentate de tranziția la economia circulară.

Odată ce rezultatele sondajului au fost colectate, prelucrate și sintetizate, acestea au fost analizate și discutate în luna decembrie 2019 în cadrul unui atelier de lucru dedicat, care a adus laolaltă 20 de profesioniști din 9 state membre UE, cu expertiză diferită, de la sectorul mobilei și proiectare ecologică la legislațiile specifice economiei circulare. Exercițiile de brainstorming în care s-au implicat experții și contribuțiile acestora ne-au ajutat să actualizăm și să ajustăm cele 49 de evoluții prognozate și să îmbunătățim previziunea cu privire la modul în care sectorul va evolua până în anul 2030.

Ca rezultat final al acestor procese, **a fost elaborat raportul „Scenariul prognozat pentru sectorul mobilei din perspectiva economiei circulare în perspectiva anului 2030"**. Acesta conține scenariul previzionat în legătură cu impactul tranziției sectorului către o economie mai circulară, pornind de la scenariul previzionat anterior în cadrul proiectului DIGIT-FUR axat pe transformarea digitală a sectorului până în anul 2025. Această nouă previziune poate stimula o gândire mai cuprinzătoare cu privire la viitoarele activități strategice și investiții. Viziunea conturată este:

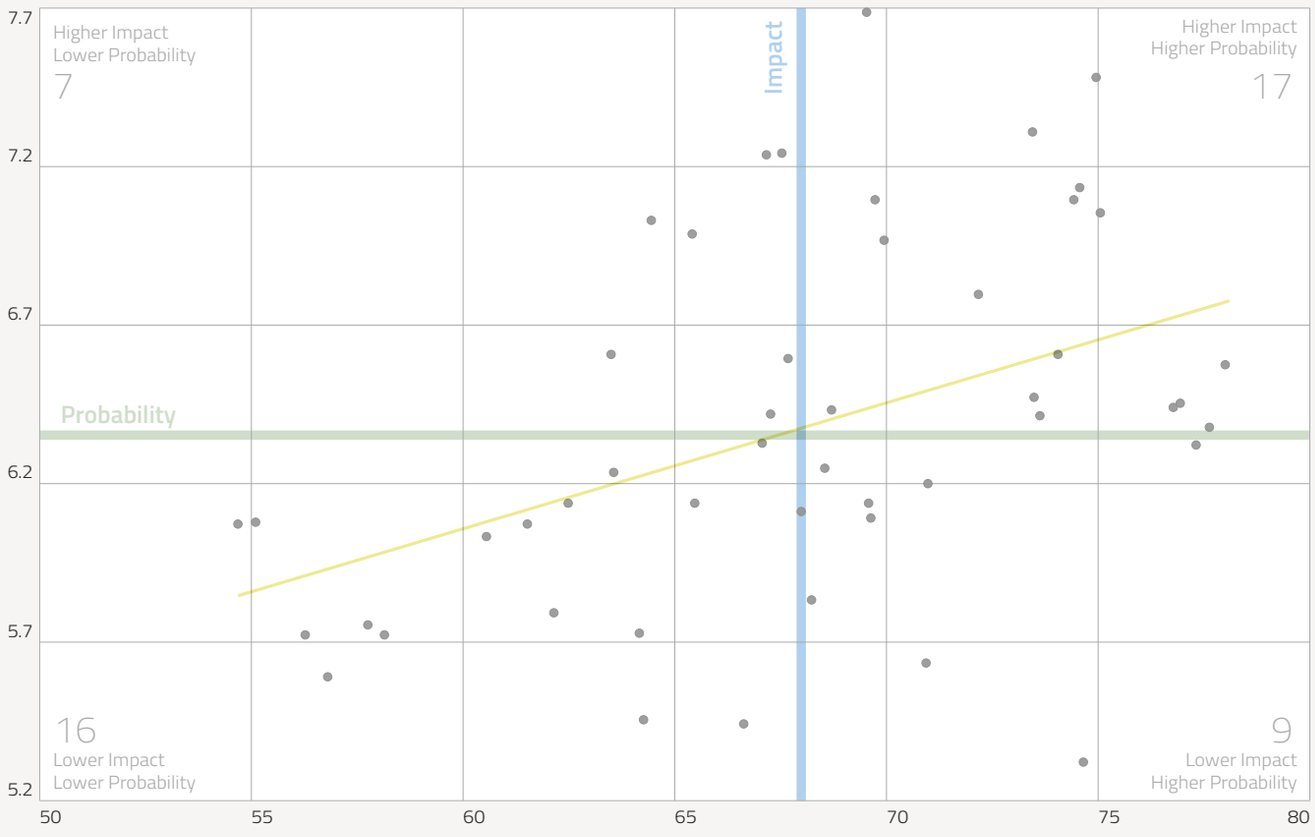
*Până în 2030, cu un **sector al mobilei în cea mai mare parte digitalizat**, industria producătoare de mobilă pe bază de lemn va oferi **produse și servicii concepute cu grijă pentru mediu**, realizate din **materii prime cu impact redus și trasabile și aplicând procese de fabricație sustenabile**, promovând în același timp și **cele mai bune scenarii de utilizare și recuperare a materialelor și produselor scoase din uz.** Clienții (persoane juridice (B2B) sau persoane fizice (B2C)) vor solicita informații mai detaliate despre produse și **caracteristicile care privesc sustenabilitatea** ale acestora, inclusiv indicatori specifici ciclului de viață, iar capacitatea consumatorilor de a-și impune punctul de vedere va fi cheia atingerii cu succes a obiectivelor de circularitate. Autoritățile (la nivel local, național și european) vor facilita circularitatea stimulând **scenarii durabile pentru expirarea sau scoaterea din uz** a materialelor și produselor pe bază de lemn, extinzând **schemele de achiziții publice și private ecologice** și promovând **politici pentru o utilizare mai eficientă a materialelor**.*

Această viziune arată clar **o strânsă legătură între tranziția sectorului către o economie mai circulară și transformarea sa digitală**. Aceste două evoluții au efecte combinate, puternice și pe termen lung una asupra celeilalte și doar a **analiză comună a** impactului lor poate oferi o previziune realistă și utilă cu privire la modul în care sectorul mobilei va arăta în anii și deceniile următoare și, astfel, poate **fundamenta în mod corespunzător deciziile strategice ale părților interesate din sector**.

Versiunile complete ale rapoartelor pot fi consultate la: circularfurniture-sawyer.eu/downloads/

Graficul indică faptul că nu există o corelație clară între impactul și probabilitatea evoluțiilor, dar și că ne lipsesc evoluțiile cu valori ale impactului mai mici de 5 și mai mari de 8, pe o scara de la 0-10.

Figura 2.- Distribuția celor 49 de evoluții prognozate în funcție de valorile probabilității și impactului acestora.



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

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

Class	Instrument	**Forecasted Evolution** Importance = Probability x Impact. Probability: scale 1 - 100. Impact: scale 1 - 10	**Importance**	Probability Mean Value	Probability Standard devation	Impact Mean Value	Impact Standard devation
1	ECD	The furniture is designed to reduce the impact of used raw materials (use of recycled materials, reduction of hazardous substances content, use of wood with lower environmental impact, use of proximity wood, etc.), provoking changes in the supply chains of companies and in the managing of old furniture collected when the new one is delivered, generating new business models.	561	75	15	7,48	1,61
2	ECD	Low, medium and high quality furniture is designed to optimize its recovery at the end of its life cycle (to facilitate materials disassembly and separation, modularity for reuse of certain parts, reuse and remanufacturing enhancement, etc.).	537	73	18	7,30	1,61
3	EPR	Some national authorities define an Extended Producer Responsibility scheme or take-back scheme for some furniture products, forcing to define a system for the collection and treatment of these products at the end of their life cycle, being the organisation that put the product on the market the one responsible for covering the associated costs.	534	70	23	7,68	1,79
4	CE	The implementation of the actions proposed in the Circular Economy Package of the EC (COM (2015) 614) will generate changes in the productive models of the furniture sector, developing processes and machinery that are more efficient and generating less waste, based on lean manufacturing principles and new ICT technologies (Industry 4.0).	531	75	16	7,13	1,91
5	CUS	New technologies (e.g. Internet of Things, blockchain, BIM, RFID tags, etc.) are used to improve the traceability of wood products to ensure the chain of custody along the whole value chain and to create Material Passports to facilitate their reusing and recycling.	529	75	14	7,04	1,54
6	GPP	In Europe, it has been achieved the objective that 50% of public procurement tenders for furniture include all environmental criteria of green public procurement set by the European Union or all the ones set by each country. This percentage will be higher than 70%, if we include also those public procurement tenders for furniture that include only some of these environmental criteria.	528	74	17	7,09	1,69
7	CUS	Customers, final customers (B2C) and especially intermediate customers (B2B), demand that the furniture product has a chain of custody certification, according to existing schemes (FSC, PEFC, etc.), which have become a standard.	512	78	16	6,57	1,96
8	FEM	The European Commission decides to regulate the emission of formaldehyde of products at European level, fixing a value lower than category E1 (<0.124 mg/m3) currently fixed in several European countries and in the voluntary agreement of EPF (European Panel Federation) members, bringing harmonization to a fragmented single market.	496	77	17	6,44	1,92
9	ECD	The majority of furniture is designed to extend its life cycle (more resistant materials/joints, facilitate its repair and maintenance, etc.), increasing its quality. The furniture that is not meant to last, will be designed in such a way that is easy to re/upcycle.	494	70	19	7,09	1,84
10	CUS	Customers, final customers (B2C) and especially intermediate customers (B2B), demand that the furniture products use wood from forests with certified management according to certificates such as FSC, PEFC, or others equivalent, which have become a standard.	494	78	16	6,36	1,95
11	REA	The proposal presented within the REACH Regulation framework is approved to restrict the placing on the market or the use of items that emit formaldehyde at concentration levels equal or lower to 0.124 mg/m3 (equivalent to category E1), bringing harmonization to a fragmented single market	494	77	17	6,43	2,06
12	GPP	All European countries have developed Green Public Procurement criteria for furniture, either by adopting the EU recommendations or by developing their own. Only some of them will approve a law based on these criteria, the others will just consider them as recommendations. A European directive to implement green public procurement will be adopted and countries will follow it, but some of them probably won't have it fully transposed by 2030.	490	72	18	6,79	1,56
13	GBC	The criteria associated with the use of furniture that uses sustainable materials acquires greater relevance in the systems of Green building certification (e.g. LEED or BREEAM), encouraging their use in those buildings that aim to obtain this type of certification. This will act as a driver that will encourage the use of these more sustainable materials, also for buildings that don't have these certifications.	489	74	17	6,60	1,77
14	ErP	Ecological design requirements are defined for products not-related with energy, such in the case of furniture sector products, under the eco-design (ErP) directive framework (2009/125/EC). These criteria include aspects of materials efficiency such as durability requirements, reparability, spare parts availability, disassembling easiness, use of materials, source of materials (from previous products, raw material, reused materials), etc. Private sector could exploit this to create new services and opportunities.	489	68	24	7,23	1,63
15	CE	The implementation of the actions proposed in the Circular Economy Package of the EC (COM (2015) 614) will produce changes in the customer service models, increasing the information to be provided to customers (for example: content of hazardous substances, product durability, manuals for repair and maintenance, instructions for the end of life management, etc.).	488	77	19	6,31	2,05
16	CUW	The European Commission reinforces its circular economy strategy by promoting the strategy of cascading use in the wood sector, facilitating the recovery of wood in the different stages of the product, optimising its use according to the wood quality (less contaminated, etc.)	487	70	19	6,96	1,71

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

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
35	ROH	Furniture sector products that contain electrical and electronic components are affected by the requirements of the RoHS Directive (EU 2017/2102), and therefore their components cannot contain substances such as brominated flame retardants (PBDE, PBB) or heavy metals such as lead, mercury, cadmium or hexavalent chromium, including components purchased and finished outside the EU.	396	75	20	5,31	2,15
36	FOR	The EU Forest Strategy extends beyond forests and deals with aspects of its value chain, such as how forest resources are used to produce products or services, taking into account regional/local conditions but without specifying requirements that imply compliance.	396	64	21	6,22	1,48
37	ECL	50% of the furniture sector products have at least one type of environmental ecolabel. Ecolabel Type II will be the most common one, but Type I and III will also grow.	383	63	20	6,13	1,55
38	ECL	Customers (final or intermediate customers) will not value ecolabels Type I (according to ISO 14024) in a massive way. Just some of these ecolabels will be widely recognized and clients will consider them important, especially in specific markets and for specific products.	373	62	22	6,07	1,78
39	EMS	Some intermediate customers (B2B), value positively that the furniture products supplier in the sector has a certified environmental management system, either EMAS or ISO-14001, which has become a competitive advantage.	367	64	20	5,72	2,14
40	ECL	Intermediate customers (B2B) positively value that the furniture products have a Type III ecolabel (according to ISO 14025), which has become a competitive advantage. Final customers (B2C) will still have many difficulties to appreciate/understand the value of Type III ecolabel for products.	365	61	21	6,02	2,02
41	FLA	Consumers do not have sufficient knowledge on fire safety to determine whether it would be appreciated that a product does not contain dangerous flame retardants (and a label could have the opposite desired effect, leading the consumer to think that fire safety decreases if no flame retardants are used), thus a specific label of "flame retardant-free" would not be effective/desired.	362	67	23	5,43	2,00
42	EMS	In Europe, 15% of companies of the furniture sector have a certified environmental management system, either EMAS or ISO-14001. The impact on certified companies will be high along the whole value chain.	360	62	24	5,78	2,00
43	ILL	The signature of an agreement, under the umbrella of the FLEGT Regulation (Regulation (EC) No 2173/2005), will be compulsory between countries that want to sell wood / wood products in the EU. A stronger market surveillance will prevent the importation and sale of illegal timber products in the EU.	350	64	18	5,44	1,83
44	ECD	20% of the European furniture sector companies will adopt criteria defined by Ecodesign ISO-14006 management system, but only 5% will reach the certification.	334	55	23	6,07	1,90
45	ECD	Few final customers (B2C) and some intermediate customers (B2B), positively value that the furniture products supplier in the sector has an Eco-design ISO-14006 management system, which has become a competitive advantage in niche markets and public procurement.	333	58	24	5,72	1,82
46	END	In some pilot cases and specific regions, wood furniture and panels waste are used to produce second generation biofuels, which meet the sustainability requirements set out in Directive 2018/2001/EU.	332	58	22	5,74	1,98
47	EPR	Some major manufacturers and distributors of the furniture sector and some municipalities at local level agree to define an Extended Producer Responsibility scheme or take-back scheme, which allows the products collection, return and treatment at the end of their life cycle.	332	55	26	6,06	2,39
48	ECL	The different Type I ecolabels criteria that affect the furniture sector are not unified yet, this is hindering their understanding by customers (for example European label, Blue Angel, Nordic Swan, etc.).	322	56	25	5,71	2,18
49	ECL	The amount of companies with a Type II ecolabel (according to ISO 14021) will increase a lot until 2030. This is a positive first step for this trend, but educated consumers will not give much value to self-declarations.	317	57	21	5,58	1,93

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

Conceptele și cadrul avute în vedere în analiza modificărilor profilurilor ocupaționale

În această secțiune, facem o prezentare a cadrului și conceptelor pe care le-am utilizat pentru a analiza impactul tranziției la economia circulară asupra sectorului mobilei din UE, în perspectiva Dublei tranziții a sectorului. Ca bază a analizei, am folosit cadrul pârghiilor ReSOLVE dezvoltat de Centrul McKinsey și Fundația Ellen MacArthur (Crescând în interior: O viziune asupra economiei circulare pentru o Europă competitivă, 2015 bit.ly/2MreFWM) și am analizat modul în care diferitele pârghii au avut impact asupra sarcinilor existente asociate profilurilor ocupaționale și, în cele din urmă au condus la crearea altor sarcini.

Pornind de la modificările survenite la nivelul sarcinilor asociate profilurilor ocupaționale, am identificat evoluția riscurilor SSM și a necesarului de aptitudini în contextul tranziției sectorului mobilei către o economie mai circulară. În secțiunea următoare, prezentăm aceste modificări pentru fiecare dintre cele unsprezece profiluri prin intermediul mai multor tabele.

Versiunile complete ale rapoartelor pot fi consultate la: circularfurniture-sawyer.eu/downloads/

Explicarea pârghiilor RESOLVE

Acest prim tabel descrie pe scurt pârghiile identificate de Centrul McKinsey și Fundația Ellen MacArthur ca acceleratori cheie ai tranziției către o economie mai circulară. Aceste pârghii au fost ușor adaptate de către noi la sectorul mobilei.

Tabelul 4.- Explicarea pârghiilor ReSOLVE, raportat la sectorul mobilei

	Pârghii	Scurtă descriere
Regenerare	Trecere la energiile regenerabile	Utilizarea în principal a energiilor regenerabile, de exemplu energia solară sau eoliană, inclusiv biomasă (de exemplu, utilizarea posibilă a reziduurilor de lemn ca sursă de energie).
	Trecerea la materiale regenerabile	Utilizarea materialelor pe bază de lemn din surse mai durabile sau înlocuirea altor materiale (de exemplu, piese din plastic, metale sau textile) cu alternative regenerabile.
	Redobândirea, menținerea și regenerarea sănătății ecosistemelor	Facilitarea regenerării ecosistemelor deteriorate de activitățile lor, de exemplu, promovarea gestionării sustenabile a pădurilor și plantațiilor, regenerarea terenurilor, conservarea biodiversității etc.
	Înapoierea resurselor biologice recuperate biosferei	Facilitarea redării deșeurilor de lemn biosferei (de exemplu, redarea cenușii rezultate din incinerarea lemnului ca substanțe nutritive pădurilor etc.).
Utilizare în comun / utilizare partajată	Reducerea vitezei de înlocuire a produselor și creșterea gradului de utilizare a produselor prin utilizarea acestora în comun de către diferiți utilizatori	Promovarea utilizării în comun produselor, de exemplu a produselor în proprietate privată sau prin partajarea publică a unui grup de produse.
	Reutilizarea produselor pe toată durata vieții lor tehnice	Sprijinirea reutilizării produselor, de exemplu facilitarea recondiționării sau remanufacturării produselor (de exemplu, curățare, demontare etc.) și furnizarea de informații despre caracteristicile produselor (de exemplu, procesul de dezasamblare, materialele și componentele utilizate etc.).
	Prelungirea duratei de viață a produselor prin întreținere	Facilitarea întreținerii produselor prin furnizarea de instrucțiuni de întreținere utilizatorilor sau servicii specializate (ex. cerințe de întreținere a stratului de acoperire, produse de întreținere recomandate etc.).
	Prelungirea duratei de viață a produselor prin reparații	Facilitarea reparării produselor (de către utilizator sau prin servicii specializate), de exemplu furnizarea de informații despre reparații, piese de schimb și livrarea rapidă a acestora la un preț rezonabil, facilitarea demontării/asamblării produselor, prelungirea perioadei de garanție sau furnizarea de informații despre caracteristicile produselor (de exemplu, procesul de demontare, materiale și componente utilizate etc.).
	Prelungirea duratei de viață a produselor printr-o proiectare / design care să asigure durabilitatea acestora	Extinderea durabilității produsului prin proiectare, de exemplu, folosind materiale și accesorii mai durabile, evitând perimarea estetică, aplicând un concept modular/adaptabil etc.

	Pârghii	Scurtă descriere
Optimizarea	Creșterea performanței/ eficienței produselor	Creșterea performanței produselor, de exemplu printr-un concept modular, folosind un număr mai mic de piese și materiale, oferind mai multe funcționalități etc.
	Personalizare/realizare la comanda	Personalizarea produselor în funcție de nevoile și cerințele consumatorilor sau fabricarea la cerere (de exemplu, lotul de dimensiune 1, personalizare masivă).
	Fabricație reproductibilă și adaptabilă	Modernizarea proceselor de fabricație pentru a fi reproductibile, mai adaptabile, mai flexibile și autonome vizavi de modificările cererii și necesitățile de producție (Industria 4.0).
	Reducerea la minimum a deșeurilor rezultate din producție și lanțul de aprovizionare	Reducerea producției de deșeuri de-a lungul întregului ciclu de viață al produselor, de exemplu a cantității de ambalaje (de la furnizori și din procesul de distribuție al produselor), resturi de producție etc.
	Creșterea eficienței proceselor de producție	Creșterea eficienței proceselor de producție, de exemplu aplicând noi tehnologii 4.0 (ex., roboți, utilizarea analizei volumelor mari de date etc.), echipamente mai eficiente sau metode noi (ex., optimizarea producției / producție de tip lean).
Buclă	Re-fabricarea produselor și/ sau componentelor	Re-fabricarea directă a produselor sau pieselor, de exemplu definirea sistemelor de colectare, implementarea proceselor de re-fabricare (ex. sortare și curățare, înlocuirea componentelor/materialelor etc.) și definirea mecanismelor de testare și validare a calității.
	Implementarea de programe de preluare	Demararea programelor de preluare a produselor companiei (ex. puncte de colectare, logistică inversă, procese de tratare, scenariu la scoaterea din uz pentru materialele recuperate etc.).
	Reciclarea materialelor	Creșterea gradului de utilizare a materialelor reciclate (ex. materiale pe bază de lemn reciclate), definirea cerințelor de calitate și aprovizionare pentru materialele reciclate, proceduri de testare, mecanism de validare a calității etc.
	Promovarea utilizării în cascadă a lemnului	Susținerea utilizării în cascadă a lemnului, de exemplu facilitând reciclarea (compatibilitatea materialelor etc.), evitând utilizarea substanțelor periculoase, furnizând informații despre materialele și substanțele utilizate etc.
	Promovarea extracției substanțelor biochimice din deșeurile organice	Promovarea digestiei anaerobe sau extragerii substanțelor biochimice din deșeurile de lemn, de exemplu, evitarea utilizării unor posibile substanțe contaminante, ceea ce facilitează procesul de recuperare.
Virtualizare	Virtualizarea aspectelor care țin direct de produs	Dematerializarea (virtualizarea) produsului în sine, de exemplu prin proiectare virtuală pentru client, simularea performanței produsului etc.
	Virtualizarea aspectelor care țin indirect de produs	Dematerializarea (virtualizarea) aspectelor care țin indirect de produs, de exemplu cumpărături online, servicii de asistență virtuală, informații digitale despre produs pentru consumator etc.
Schimb	Înlocuirea materialelor vechi cu materiale regenerabile avansate	Înlocuirea materialelor vechi cu alte materiale regenerabile avansate, de exemplu noi tipuri de laminate, noi tipuri de straturi de acoperire, noi aditivi etc.
	Aplicarea de noi tehnologii	Implementarea și adoptarea noilor tehnologii 4.0 în produs și în procesele de producție (ex. fabricarea aditivilor, Internetul Lucrurilor (IoT), realitatea augmentată etc.)
	Selectarea de noi produse și servicii	Dezvoltarea de noi produse, servicii și modele de afaceri/activitate/economice, De exemplu servitizare (produsul oferit ca serviciu), produse multifuncționale etc.

Nivelul impactului instrumentelor legislative și voluntare și al politicilor asupra pârghiilor ReSOLVE

Tabelul care urmează prezintă nivelul preconizat al impactului instrumentelor legislative și voluntare și al politiciloridentificate asupra pârghiilor propuse ale de cadrul ReSOLVE pentru economia circulară în perspectiva anului 2030.

0.- Până în anul 2030, nu se preconizează niciun impact asupra producătorilor de mobilă din lemn
1.- Până în anul 2030, se preconizează un impact minor asupra producătorilor de mobilă din lemn
3.- Până în anul 2030, se preconizează un impact mediu asupra producătorilor de mobilă din lemn
5.- Până în anul 2030, se preconizează un impact major asupra producătorilor de mobilă din lemn

Valorile superioare evidențiază acele instrumente care ar putea avea un impact mai mare asupra pârghiilor și care pârghie ar putea fi mai afectată de respectivele instrumente. Aceste informații pot fi utilizate de companie pentru a-și defini în mod corespunzător propria strategie în domeniul circularității și a se alinia acestor instrumente.

Tabelul 5.- Nivelul impactului instrumentelor legislative și voluntare și al politicilor asupra pârghiilor ReSOLVE.

		Regenerare			
		Trecere la energiile regenerabile	Trecerea la materiale regenerabile	Redobândirea, menținerea și regenerarea sănătății ecosistemelor	Înapoierea resurselor biologice recuperate biosferei
Instrumente legislative	Pachetul privind economia circulară al CE	3	5	3	3
	Directiva privind deșeurile de echipamente electrice și electronice (DEEE)	0	0	0	0
	Restricționarea substanțelor periculoase în echipamentele electrice și electronice (RuSP)	0	0	0	0
	Directiva privind produsele cu impact energetic (Directiva PIE sau privind proiectarea ecologică)	0	3	1	0
	Responsabilitatea extinsă a producătorilor (scheme REP)	3	3	1	3
	Regulamentul privind substanțele periculoase/REACH	0	3	1	1
	Emisiile de formaldehidă/COV	0	1	0	0
	Normele UE privind criteriile pentru „încetarea statutului de deșeu"	3	3	1	3
	Substanțe ignifuge	1	1	0	0
	Directiva privind energia regenerabilă (DER II)	5	0	0	3
	Exploatarea forestieră ilegală și comerțul ilegal cu cherestea	0	3	3	0
Instrumente voluntare	Achiziții publice ecologice	1	5	1	0
	Managementul mediului în organizații	3	1	3	3
	Metodologia privind proiectarea ecologică	3	5	0	1
	Etichetele ecologice (Tip I, II și III)	1	3	1	0
	Certificarea lanțului de custodie	0	5	5	1
	Certificare a clădirilor ecologice	1	3	1	0
Politici	Utilizarea în cascadă a lemnului	3	5	1	3
	Politica industrială a UE pentru silvicultură	1	3	3	1
	Planul privind industriile bazate pe exploatarea pădurii	1	3	1	1
	Bioeconomia	1	3	3	1
	Total	30	58	29	24

	Utilizare în comun					Optimizarea					Buclă					Virtualizare		Schimb			
	Reducerea vitezei de înlocuire a produselor și creșterea gradului de utilizare a produselor prin utilizarea acestora în comun de către diferiți utilizatori	Reutilizarea produselor pe toată durata vieții lor tehnice	Prelungirea duratei de viață a produselor prin întreținere	Prelungirea duratei de viață a produselor prin reparații	Prelungirea duratei de viață a produselor prin proiectare care asigură durabilitatea acestora	Creșterea performanței/eficienței produselor	Personalizare/realizare la comanda	Fabricație reproductibilă și adaptabilă	Reducerea la minimum a deșeurilor rezultate din producție și lanțul de aprovizionare	Creșterea eficienței proceselor de producție	Re-fabricarea produselor și/sau componentelor	Implementarea de programe de preluare	Reciclarea materialelor	Promovarea utilizării în cascadă a lemnului	Promovarea extracției substanțelor biochimice din deșeurile organice	Virtualizarea aspectelor care țin direct de produs	Virtualizarea aspectelor care țin indirect de produs	Înlocuirea materialelor vechi cu materiale regenerabile avansate	Aplicarea de noi tehnologii	Selectarea de noi produse și servicii	Total
	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	

Clasificarea pârghiilor ReSOLVE și a instrumentelor legislative, și voluntare și a politicilor după impact

Următoarele două tabele au la bază rezultatelor analizei anterioare.

Primul tabel prezintă clasificarea pârghiilor ReSOLVE cel mai afectate de instrumentele legislative și voluntare și de politicile identificate anterior.

Tabelul 6.- Clasificarea după impact a pârghiilor ReSOLVE

Pârghii ReSOLVE	Punctaj
Reciclarea materialelor	68
Trecerea la materiale regenerabile	58
Promovarea utilizării în cascadă a lemnului	55
Selectarea de noi produse și servicii	50
Aplicarea de noi tehnologii	48
Creșterea eficienței proceselor de producție	48
Prelungirea duratei de viață a produselor printr-o proiectare / design care să asigure durabilitatea acestora	43
Înlocuirea materialelor vechi cu materiale regenerabile avansate	43
Reutilizarea produselor pe toată durata vieții lor tehnice	40
Fabricație reproductibilă și adaptabilă	40
Reducerea la minimum a deșeurilor rezultate din producție și lanțul de aprovizionare	38
Implementarea de programe de preluare	37
Re-fabricarea produselor și/sau componentelor	36
Virtualizarea aspectelor care țin indirect de produs	36
Personalizare/realizare la comanda	33
Prelungirea duratei de viață a produselor prin reparații	32
Creșterea performanței/eficienței produselor	31
Trecere la energiile regenerabile	30
Redobândirea, menținerea și regenerarea sănătății ecosistemelor	29
Înapoierea redării resurselor biologice recuperate biosferei	24
Reducerea vitezei de înlocuire a produselor și creșterea gradului de utilizare a produselor prin utilizarea acestuia în comun de către diferiți utilizatori	21
Prelungirea duratei de viață a produselor prin întreținere	21
Virtualizarea aspectelor care țin direct de produs	20
Promovarea extracției substanțelor biochimice din deșeurile organice	18

care joacă un rol cheie în accelerarea tranziției sectorului mobilei către o economie mai circulară.

Al doilea tabel prezintă clasificarea instrumentelor și politicilor care au cel mai mare impact asupra pârghiilor ReSOLVE.

Tabelul 7.- Clasificarea după impact a instrumentelor și politicilor economiei circulare

Instrumente	Punctaj
Pachetul privind economia circulară al CE	84
Responsabilitatea extinsă a producătorilor (scheme REP)	78
Achiziții publice ecologice	74
Metodologia privind proiectarea ecologică	64
Utilizarea în cascadă a lemnului	60
Planul privind industriile bazate pe exploatarea pădurii	59
Etichetele ecologice (Tip I, II și III)	54
Certificarea lanțului de custodie	43
Regulamentul privind substanțele periculoase/REACH	42
Managementul mediului în organizații	37
Directiva privind produsele cu impact energetic (Directiva PIE sau privind proiectarea ecologică)	37
Substanțe ignifuge	35
Bioeconomia	35
Certificarea clădirilor ecologice	34
Normele UE privind criteriile pentru „încetarea statutului de deșeu"	34
Exploatarea forestieră ilegală și comerțul ilegal cu cherestea	26
Emisiile de formaldehidă/COV	26
Directiva privind deșeurile de echipamente electrice și electronice (DEEE)	24
Directiva privind energia regenerabilă (DER II)	21
Politica industrială a UE pentru silvicultură	20
Restricționarea substanțelor periculoase în echipamentele electrice și electronice (RuSP)	12

Riscuri și pericole în industria mobilierului din lemn

Prelucrarea lemnului în industria mobilierului poate fi periculoasă pentru lucrători. De la utilizarea mașinilor și instrumentelor și manipularea materialelor grele până la expunerea la praf, zgomot și substanțe chimice – evenimente potențial dăunătoare se pot întâmpla în orice moment. Aceste evenimente pot afecta starea de sănătate a lucrătorilor, de exemplu provocându-le boli de piele și respiratorii. Acestea pot, de asemenea, provoca leziuni precum pierderea degetelor sau chiar moartea.

În Tabelul 8 veți găsi o prezentare generală a diferitelor tipuri de pericole cu care se pot confrunta lucrătorii din fabricile de mobilă din lemn. Acesta este rezultatul muncii expertului nostru extern în domeniul SSM, rezultat bazat pe diferite surse de informații și o analiză a acestora. Cu ALBASTRU sunt ilustrate pericolele cauzate de digitalizarea sectorială în perspectiva anului 2025. În plus, cu VERDE am evidențiat noile pericole asociate cu tranziția la economia circulară până în anul 2030.

Pericolele enumerate în tabel sunt legate de industria mobilei – fabricile mobilă – și potențialele activități noi care ar putea fi desfășurate în aceste fabrici datorită noilor procese de producție și a modelelor de activitate apărute mulțumită unei economii mai circulare (de exemplu, re-fabricare, reparații etc.).

Cu condiția ca securitatea și siguranța la locul de muncă să fie o parte integrantă din procesele de management și să fie avută în vedere în proiectarea de produse ecologice (de exemplu, o demontare mai ușoară, un conținut mai redus de substanțe periculoase etc.), sănătatea și securitatea lucrătorilor din sectorul prelucrării lemnului vor beneficia de pe urma strategiilor economiei circulare.

Modificările și pericolele datorate activităților și sarcinilor din industria reciclării sau asociate cu noile surse de energie nu sunt incluse în obiectul prezentei analize. Nici serviciile prestate pe teren, cum ar fi întreținere și reparații în locația clientului, nu fac obiectul prezentului raport.

Tabelul 8.- Riscuri și pericole comune și noi în sectorul mobilei.

Diferite categorii de pericole	Detalii privind pericolele din fiecare categorie și o scurtă descriere
Pericole mecanice	
• Piese în mișcare neprotejate (coboți), (strivire, lovire, zdrobire, tăiere, amputare, tragere în interior/ prindere). • Piese cu forme periculoase (tăioase, ascuțite, dure). • Mijloace de transport și scule în mișcare (coliziune, răsturnare, cădere de la înălțime). • Părți în mișcare necontrolate (obiecte zburătoare, așchii de lemn).	Unelte manuale și electrice: Risc de înjunghieri, tăieturi, amputări ale degetelor de la mâini din cauza uneltelor manuale și electrice. Re-fabricarea și dezasamblarea selectivă ar putea necesita noi tipuri de scule. Piese în mișcare neprotejate Riscul de prindere a părților corpului în piese sau mașini rotative. Piese cu forme periculoase (tăioase, ascuțite, dure).
• Alunecare și împiedicare	Alunecări, împiedicare și cădere de la înălțimi.
• Cădere de la înălțimi	Riscuri de alunecări, împiedicare din cauza suprafețelor alunecoase, scărilor, obstacolelor pe culoare, iluminării slabe, încălțămintei inadecvate, utilizării în condiții de nesiguranță / necorespunzătoare a scărilor.
• Pericole ergonomice	Riscurile cauzate de pericolele ergonomice pot scădea, în funcție de preluarea unei sarcini specifice de coboți. Pe de altă parte, lucrătorii sunt din ce în ce mai expuși la pericole ergonomice, cum ar fi lipsa exercițiului/inactivitatea, din cauza operării de la stațiile de lucru computerizate a mașinilor autonome și a coboților. Riscul poate fi redus pentru lucrători prin proiectarea mai bună a produselor (proiectare ecologică), luând în considerare aspecte, cum ar fi asamblarea și demontarea mai ușoară, o selecție mai bună a sistemelor de îmbinare etc. și dacă întreținerea în condiții de siguranță a mașinilor este avută în vedere de la bun început.
• Încărcături grele/muncă dinamică solicitantă	Risc de durere din cauza încărcăturilor grele și a muncii dinamice solicitante. Riscul poate fi redus pentru lucrători prin utilizarea roboților/coboților și a echipamentelor digitale. Demontarea bunurilor fabricate ar putea provoca afecțiuni musculo-scheletice (AMS) (ex. poziții incomode, ridicarea și transportul de greutăți).
• Poziție incomodă/solicitare neechilibrată	Risc de durere sau rănire de la lucrul în poziții incomode. Riscul poate fi redus pentru lucrători prin utilizarea roboților/coboților și a echipamentelor digitale. Operațiunile de demontare pentru recuperarea materialelor (metode distructive) pot provoca afecțiuni musculo-scheletice (AMS) suplimentare.
• Mișcări repetitive	Risc de durere sau rănire de la efectuarea de sarcini repetitive.
• Lipsă de exercițiu; inactivitate	Risc de durere cronică la nivelul gâtului și spatelui, obezitate și boli cardiovasculare rezultate din inactivitate, ședere prelungită și din practici ergonomice proaste cu dispozitive mobile.
Pericole electrice	
• Șoc electric	Pericol de electrocutare din cauza mașinilor și cablurilor electrice prost întreținute sau rupte.

Diferite categorii de pericole	Detalii privind pericolele din fiecare categorie și o scurtă descriere
Pericole ce se datorează efectelor fizice/agenților fizici	
• Zgomot	Expunerea la zgomot puternic de la mașini și unelte. Posibilitatea creșterii gradului de utilizare a utilajelor zgomotoase în activitățile de demontare și reparații. Cu toate acestea, zgomotul poate fi redus prin proiectarea ecologică a utilajelor pentru a fi mai silențioase și mai eficiente.
• Vibrații	Risc de vibrație a mâinii / brațului de la unelte sau piese de prelucrat ce vibrează. Posibilă utilizare suplimentară a sculelor cauzatoare de vibrații în timpul fabricării sau reparării produsului (aparat de lustruit etc). Cu toate acestea, vibrațiile pot fi reduse prin proiectarea ecologică a utilajelor pentru a fi mai eficiente și a genera mai puține vibrații.
• Lumină laser	Expunerea la lumina laser a mașinilor de debitat cu laser.
Pericole de incendiu și explozie	
• Substanțe inflamabile	Explozie: Riscuri de explozie din cauza materialelor, inclusiv praful de lemn și substanțele chimice. Reciclarea produselor din lemn va genera unor niveluri ridicate de praf de lemn și particule fine în timpul zdrobirii. În absența unor sisteme eficiente de extracție a prafului, riscul de explozie poate crește. Solvenții, produsele de curățare și lubrifianții utilizați în prelucrarea lemnului pot avea la bază substanțe mai puțin periculoase (de exemplu, solvenți) și, astfel, s-ar putea preveni pericolele de incendiu.
	Incendiu: Risc de incendiu din cauza substanțelor chimice și a prafului de lemn. Reciclarea produselor din lemn va genera unor niveluri ridicate de praf de lemn și particule fine în timpul zdrobirii. În absența unor sisteme eficiente de extracție a prafului, riscul de incendiu poate crește. Solvenții, produsele de curățare și lubrifianții utilizați în prelucrarea lemnului pot avea la bază substanțe mai puțin periculoase (de exemplu, solvenți) și, astfel, s-ar putea preveni pericolele de incendiu.
Pericole legate de ambientul locului de muncă	
Condiții de iluminare slabă	Risc de lumină orbitoare sau de lumină insuficientă, precum și de lumină pâlpâitoare.
Climat	Riscul de a fi expus la un mediu de lucru cald sau rece, combinat cu umiditate sau curenți de aer.
Ventilație slabă	Riscul de a fi expus la un mediu de lucru ce are condiții slabe de ventilație sau de asigurare a aerului curat.
Pericole legate de substanțele periculoase	Riscul poate fi atenuat pentru lucrători utilizând roboți/cobotilor și echipamentele digitale pentru manipularea substanțelor periculoase. Fabricație: Pericolele pot fi reduse dacă SSM va fi o parte integrantă a procesului de proiectare a produselor/materialelor. Necesarul de solvenți poate fi redus, solvenți mai puțin periculoși ar putea fi folosiți și s-ar putea reduce utilizarea substanțelor ignifuge periculoase în cazul în care este adoptată o legislație specifică nouă sau sunt implementate bune practici. Reciclarea/utilizarea materialelor reciclate: Pericolele pot fi intensificate de lipsa informațiilor despre substanțele chimice conținute în produsele reciclate și despre modalitățile de tratare adecvată a acestora.
• Praf	Riscul de cancer din cauza prafului de lemn. Risc de simptome alergice respiratorii din cauza prafului de lemn. Reciclare – Expunere crescută la praf: expunere la fibre sau praf în procesele de dezasamblare, re-fabricare și reparare a mobilierului; praful din materialele reciclate de origine necunoscută poate provoca astm profesional (cazuri de astm profesional au fost raportate în asociere cu reciclarea lemnului și a hârtiei).
• Solvenți (neurotoxici, alergeni)	Riscuri generate de substanțele chimice periculoase, solvenți și alte materiale – dermatită, reacții alergice sau probleme respiratorii, leziuni ale organelor. Fabricare: necesarul de solvenți poate fi redus, pot fi utilizați solvenți mai puțin periculoși. Activitățile de reparații și re-fabricare pot crește necesarul de solvenți (curățarea lacului, curățarea pieselor uzate).
• Agenți cancerigeni	Riscuri de cancer cauzate de substanțe chimice (substanțe ignifuge periculoase în special în produsele de tapițerie; adezivi și agenți de acoperire sunt utilizați pentru finisarea produselor din lemn, cum ar fi solvenții din vopsele, cleiuri, lacuri și produse chimice pentru decaparea vopselurilor). Fabricare: necesarul de solvenți poate fi redus, pot fi utilizați solvenți mai puțin periculoși. Reciclarea și utilizarea materialelor reciclate: Materialele reciclate pot conține substanțe periculoase care, conform celor mai recente descoperiri, sunt cancerigene sau toxice pentru reproducere (în prezent cu utilizare restricționată prin lege (REACH)).
• Materiale noi (de exemplu, nanomateriale)	Riscul de expunere la nanomateriale: există lacune mari în cunoștințele despre pericolele pentru sănătate asociate nanomaterialelor. Pe de altă parte, materialele noi pot fi înlocuitori mai siguri pentru substanțele periculoase.
• Materiale reciclate	Materialele reciclate pot concentra substanțe periculoase (impurități și substanțe ignifuge periculoase în principal în produsele de tapițerie) în timpul reciclării succesive sau își pot modifica compoziția datorită anumitor factori, cum ar fi lumina, căldura și îmbătrânirea materialului → substanțe periculoase de tip și cu conținut necunoscute.

Diferite categorii de pericole	Detalii privind pericolele din fiecare categorie și o scurtă descriere
Pericole biologice	
• Manipularea microorganismelor: Riscuri din activități ne-vizate (secundare) cu microorganisme.	Companii noi care își folosesc propriile deșeuri de lemn ca sursă de energie. Activitățile de re-fabricare și sistemele de preluare a mobilierului vechi pot pune lucrătorii în pericolul de a fi expuși la microorganisme, cum a fi mucegaiul.
Riscuri psihosociale	Mediul de lucru și natura muncii în sine sunt ambele influențe importante asupra sănătății și bunăstării oamenilor ce lucrează.
• Volum de muncă excesiv	Volumul de muncă excesiv supune lucrătorii la riscul unui nivel ridicat de presiune temporală și de lucru la limită.
• Satisfacție profesională scăzută	Satisfacția scăzută la locul de muncă conduce la suferință psihologică pentru lucrători și poate conduce chiar și la afecțiuni de somn, dureri de cap și probleme gastro-intestinale.
• Sarcinile de lucru nu sunt clar definite	Organizarea slabă a muncii, sarcinile care nu sunt clar definite pot duce la suprasolicitare sau solicitare insuficientă a lucrătorilor, conducând la nemulțumiri și stres.
• Organizare slabă a muncii	Organizarea slabă a muncii poate supune lucrătorii unui risc de suprasolicitare sau solicitare insuficientă, viteză de lucru excesivă impusă de mașini, niveluri ridicate de presiune temporală.
• Mediu de lucru prost proiectat (inclusiv software-ul)	Disponibilitate, compatibilitate sau întreținere necorespunzătoare a echipamentelor; condiții de mediu precare, cum ar fi lipsa spațiului, iluminare slabă sau zgomot excesiv, creează stres pentru lucrători.
• Muncă repetitivă, monotonă	
• Solicitare cognitivă	Interacțiunile cognitive cu echipamente autonome și realitatea virtuală creează stres lucrătorilor. Cerere crescută de competențe și cunoștințe actualizate cu privire la evoluțiile din economia circulară și industria reciclării.
• Stresul ce se datorează concentrării și conștientizării îndelungate	Perioadă lungă de concentrare lucrând cu un computer și un software nou și efectuând mai multe sarcini simultan.
• Cereri crescute privind flexibilitatea	Cerere crescută privind flexibilitatea: lucrătorii pot efectua anumite sarcini de oriunde prin intermediul dispozitivelor mobile. Lucrătorii sunt expuși riscului de a fi în permanență disponibili în afara orelor de lucru. Activitățile de re-fabricare și reparații, lucrul cu materiale reciclate, luarea de decizii cu privire la strategii/produse/proiecte de marketing orientate spre economia circulară și sustenabilitate și utilizarea surselor de energie regenerabile necesită mult mai multă flexibilitate.
• Lipsa experienței de muncă	Software-ul nou și dispozitivele digitale necesită instruire, unii lucrători nu au competențe suficiente și se pot simți suprasolicitați, neavând suficientă experiență. Lucrul cu materiale, care au fost fabricate anterior: trebuie dobândite noi competențe de-a lungul întregului ciclu de producție și lanț de aprovizionare. Repararea, re-fabricarea și dezasamblarea selectivă necesită noi metode și proceduri. Luarea de decizii cu privire la strategii/produse/proiecte de marketing orientate spre economia circulară și sustenabilitate.
• Lipsa implicării în luarea deciziilor care afectează lucrătorul	Lucrătorii care nu se consideră respectați și apreciați se simt vulnerabili și neajutorați.
• Comunicarea necorespunzătoare, lipsa de susținere din partea conducerii sau a colegilor	Comunicarea ineficientă din cauza atmosferei proaste de lucru sau lipsa colegilor creează stres pentru lucrători.
• Lucrul de unul singur/izolarea	Lucrul de unul singur, fără colegi, sau doar cu roboți creează stres și izolare pentru lucrători.
• Volum de lucru neechilibrat: suprasolicitare/solicitare insuficientă	Volumul de muncă dezechilibrat creează stres pentru lucrători.

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.

Scurtă descriere a abilităților, cunoștințelor și competențelor și a competențelor ecologice generice

Definițiile următoarelor concepte sunt aceleași și în ESCO (Clasificarea europeană a aptitudinilor/competențelor, calificărilor și ocupațiilor) și în Cadrul European al calificărilor.

Cunoștințe

„Cunoștințele reprezintă rezultatul asimilării de informații prin învățare. Cunoștințele reprezintă ansamblul de fapte, principii, teorii și practici legate de un anumit domeniu de muncă sau de studiu."

Atât abilitățile, cât și competențele se bazează pe cunoștințe factuale și teoretice, diferența constă în modul în care se aplică această cunoaștere și în modul prin care se pune în uz.

Abilități

„Abilitatea desemnează capacitatea de a aplica cunoștințe și de a utiliza know-how pentru a aduce la îndeplinire sarcini și pentru a rezolva probleme". Acestea pot fi descrise ca fiind cognitive (care implică utilizarea gândirii logice, intuitive și creative) sau practice (care implică dexteritate manuală și utilizarea metodelor, materialelor, uneltelor și a instrumentelor).

Competențe

„Competență înseamnă capacitatea dovedită de a utiliza cunoștințe (teoretice și practice), aptitudini și abilități personale, sociale și/sau metodologice, în contexte reale de muncă și învățare și în dezvoltarea profesională și personală." Acestea sunt descrise în termeni de responsabilitate și autonomie. Prin urmare, competențele sunt, prin definiție, individuale, orientate spre proces (orientate spre acțiune și dezvoltare) și contextuale.

În timp ce uneori sunt folosiți ca sinonime, termenii abilitate / capacitate și competență pot fi diferențiați în funcție de domeniul lor de aplicare. Termenul abilitate se referă, în mod tipic, la utilizarea metodelor sau a instrumentelor într-o anumită configurație și în funcție de sarcinile definite. Termenul competență este mai larg și se referă, în mod tipic, la capacitatea unei persoane – care se confruntă cu situații noi și provocări neprevăzute – de a folosi și de a aplica abilitățile și cunoașterea într-un mod independent și auto-orientat.

Astfel:

- **Cunoștințe = teoretice, practice, ocupaționale, industriale ...**
- **Aptitudini = cognitive, practice, sociale...**
  Abilități = cunoașterea modului în care...
- **Competență = bazată pe sarcini, ocupațională, procedurală, socială, personală... Competență = socială și personală (forțele proprii)**

Competențe ecologice generice

Competențe ecologice generice includ cunoștințe, abilități și competențe care sunt necesare pentru dezvoltarea socială, economică și de mediu a sectorului nostru de producție de mobilier din lemn. Datorită acestor competențe ecologice generice putem contribui la ecologizarea sectorului, sprijinind trecerea de la o economie liniară la una circulară. Prin urmare, trebuie dezvoltată o mentalitate ecologică pentru a minimiza impactul asupra mediului de-a lungul întregului ciclu de viață al produselor.

Dr. Margarita Pavlova a clasificat **competențele ecologice generice în patru categorii**, care sunt necesare pentru fiecare ocupație, indiferent de nivelul necesar de abilități și se aliniază cu competențele cheie sau competențele socio-culturale, care sunt esențiale pentru forța de muncă modernă. Aceste competențe socio-culturale sunt contextualizate aici din perspectiva conștientizării aspectelor de mediu și a înțelegerii dezvoltării durabile și a economiei circulare.

- **competențe cognitive** (1 la 3)
- **competențe interumane** (4 la 9)
- **competențe personale** (10 și 11)
- **competențe tehnologice** (12 la 14)

În acest studiu SAWYER, folosim aceste abilități ecologice generice în următorul context:

- **Conștientizarea aspectelor de mediu și disponibilitatea de a învăța**: despre dezvoltarea durabilă și economia circulară.
- **Abilități de analiză a sistemelor și riscurilor** pentru a evalua, interpreta și înțelege atât nevoia de schimbare, de la o economie liniară la una circulară, cât și măsurile specifice necesare pentru a susține această transformare.
- **Abilitățile de inovare** pentru a identifica ocazii favorabile și a crea noi strategii de răspuns la provocările ecologice asociate economiei circulare.
- **Competențe de coordonare, management și afaceri** pentru a facilita abordări holistice și interdisciplinare care încorporează obiective economice, sociale și ecologice în organizație, dar și de-a lungul lanțului valoric al produsului.
- **Abilități de comunicare și negociere** pentru a discuta interese conflictuale în contexte complexe asociate lanțului valoric al produsului.
- **Competențe de marketing** pentru a promova produse și servicii mai ecologice și a comunica beneficiile strategiilor aferente economiei circulare.

- **Abilități strategice și de conducere** pentru a permite factorilor de decizie politică și directorilor de companii să stabilească stimulentele potrivite și să creeze condiții care să permită o producție mai curată, un transport mai curat etc.
- **Competențe de consultanță** pentru a sfătui consumatorii cu privire la soluțiile ecologice și a răspândi utilizarea tehnologiilor ecologice și a strategiilor economiei circulare.
- **Competențe de relaționare, informatice și lingvistice** pentru a susține performanța pe piețele globale și de-a lungul lanțului valoric al produsului.
- **Capacitate de adaptare și transpunere** care împreună permit lucrătorilor să învețe și să aplice noile tehnologii și procesele necesare pentru ca locurile lor de muncă să devină mai ecologice, precum și să pună în aplicare strategiile ce țin de economia circulară.
- **Abilități antreprenoriale** pentru a valorifica oportunitățile legate de tehnologiile cu emisii reduse de carbon și modelele de afaceri circulare pentru produse și servicii.
- **Cuantificarea și monitorizarea** deșeurilor, energiei și apei pentru a urmări evoluția indicatorilor de performanță ai economiei circulare.
- Cuantificarea și monitorizarea **modului de utilizare și a impactului materialelor** în procesele de achiziții și selecție având criterii ecologice,
- **Minimizarea** nivelului de utilizare a materialelor și a impactului acestora (evaluarea impactului), având în vedere ciclul complet de viață al materialelor.

Am indicat dacă aceste competențe ecologice generice au un impact (sau nu) asupra profilurilor ESCO vizate și în ce măsură.

Seturi de competențe ecologice tehnice

Pentru anumite profiluri ocupaționale, vor fi necesare noi seturi de competențe ecologice în contextul unor sarcini noi, specifice, legate de dezasamblare și reutilizare, re-fabricare, reciclare și reciclare superioară. Aceste noi seturi de competențe sunt îndeosebi (mai) importante pentru profilurile cu caracter „practic", cum ar fi Tâmplar, Tapițer sau Reglor de mașini-unelte pentru prelucrarea lemnului, dar și pentru Muncitor necalificat, Montator de mobilier și Operator utilaje de prelucrare a lemnului. Pentru aceste profiluri, unele dintre Competențele ecologice generice legate de management, marketing și comunicare vor fi mai puțin pronunțate.

Aceste competențe vin în „completarea" cunoștințelor, abilităților și competențelor existente care sunt necesare profilurilor ocupaționale menționate mai sus.

Noile seturi de competențe ecologice vor avea, la rândul lor, un impact, deși nu la fel de semnificativ, asupra acelor profiluri care gestionează și iau decizii strategice în cadrul companiilor. În cazul profilurilor ESCO analizate, ne gândim la managerii de vânzări și marketing, managerii de producție industrială, managerii lanțului de aprovizionare și, bineînțeles, designerii de mobilier.

Noile seturi de competențe ecologice tehnice sunt:

- Demontarea produsele de mobilier din lemn.
- Examinarea pieselor dezasamblate pentru stabilirea operațiunilor următoare (reutilizare, re-fabricare, reciclare, reciclare superioară).
- Repararea pieselor de mobilier din lemn, dacă este necesar.

Profiluri ocupaționale: situația curentă și modificările preconizate în perspectiva anului 2030

Secțiunea următoare include detalii despre modificările previzionate în **sectorul mobilei** în contextul tranziției la economia circulară (cu verde pentru anul 2030) și al digitalizării (cu albastru pentru anul 2025): **sarcinile actualizate** asociate profilurilor ocupaționale vizate, **riscurile SSM existente și nou-apărute** și **nevoile actualizate de abilități, cunoștințe și competențe**. Acestea sunt prezentate prin tabele specifice care se concentrează pe fiecare dintre aceste aspecte.

În toate tabelele care urmează, textul albastru identifică orice schimbări ale situației curente în contextul digitalizării sectorului, iar textul cu verde modificările datorate tranziției sectorului la economia circulară.

Modificări ale sarcinilor

Sarcinile actuale și previzionate se modifică în contextul tranziției sectorului la economia circulară și al digitalizării pentru fiecare profil ocupațional.
În APMR verzi, **prima coloană** din stânga include o descriere detaliată a **sarcinilor curente/actualizate** asociate cu fiecare profil (în anul 2020). Coloanele și celulele din mijloc identifică sarcinile care sunt afectate de diferitele pârghii ReSOLVE. **Ultima coloană** din dreapta prezintă **previziunea cu privire la modificările sarcinilor** în urma digitalizării sectorului (cu albastru) pentru anul 2025 și a tranziției sectorului la economia circulară (cu verde) până în anul 2030.

Modificări ale pericolelor și riscurilor

Riscurile curente și previzionate se modifică în contextul digitalizării sectorului pentru fiecare profil ocupațional.
În tabelele galbene, prima și ultima coloană sunt aceleași cu cele din tabelele anterioare, cu modificările sarcinilor. Celulele centrale reprezintă previziunea pentru **o nouă clasificare a pericolelor**, identificând cu gri pe cele care nu ar trebui să se schimbe, cu verde pe cele reduse datorită economiei circulare, cu roșu pe cele noi sau crescute datorită economiei circulare, cu albastru pe cele reduse din cauza digitalizării și cu galben pe cele crescute datorită digitalizării. După acest tabel, o altă secțiune prezintă **detalii despre modificările pericolelor și riscurilor curente și previzionate** datorită tranziției sectorului la economia circulară (cu verde pentru anul 2030) și digitalizării (cu albastru pentru anul 2025).

Nevoile de aptitudini și competențe

Previzionarea nevoilor de formare ca urmare a tranziției sectorului la economia circulară (cu verde pentru anul 2030) și a digitalizării sectorului (cu albastru pentru anul 2025) pentru fiecare profil ocupațional.

În aceste tabele, în coloana din stânga, veți găsi lista cu **nevoile de abilități, cunoștințe și competențe curente și noi**, inclusiv abilități, cunoștințe și competențe ecologice generice. Cea de-a doua coloană indică, pentru fiecare profil, dacă abilitățile, cunoștințele și competențe vor fi actualizate (DA, modificat), dacă sunt încă necesare (DA sau NU), dacă sunt necesare altele noi (NOU) sau nu se aplică (NA). În ultimele coloane din dreapta, al căror număr și conținut diferă pentru fiecare profil, se identifică **motivele modificării** pentru fiecare dintre abilități, cunoștințe și competențe: punctele verzi indică faptul că modificarea se datorează tranziției sectorului la economia circulară, iar punctele albastre dacă motivul este în legătură cu digitalizarea sectorului.

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

▲ ACCESAȚI INDEXUL

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.

Sales and marketing manager ISCO 1221

2020
Occupational profile

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

New categorization of hazards

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

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

Hazards and risks changes

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

2025/30

Occupational profile

Description forecast of the occupational profile in 2030

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

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

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

ACCESAȚI INDEXUL

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.	• 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.	**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

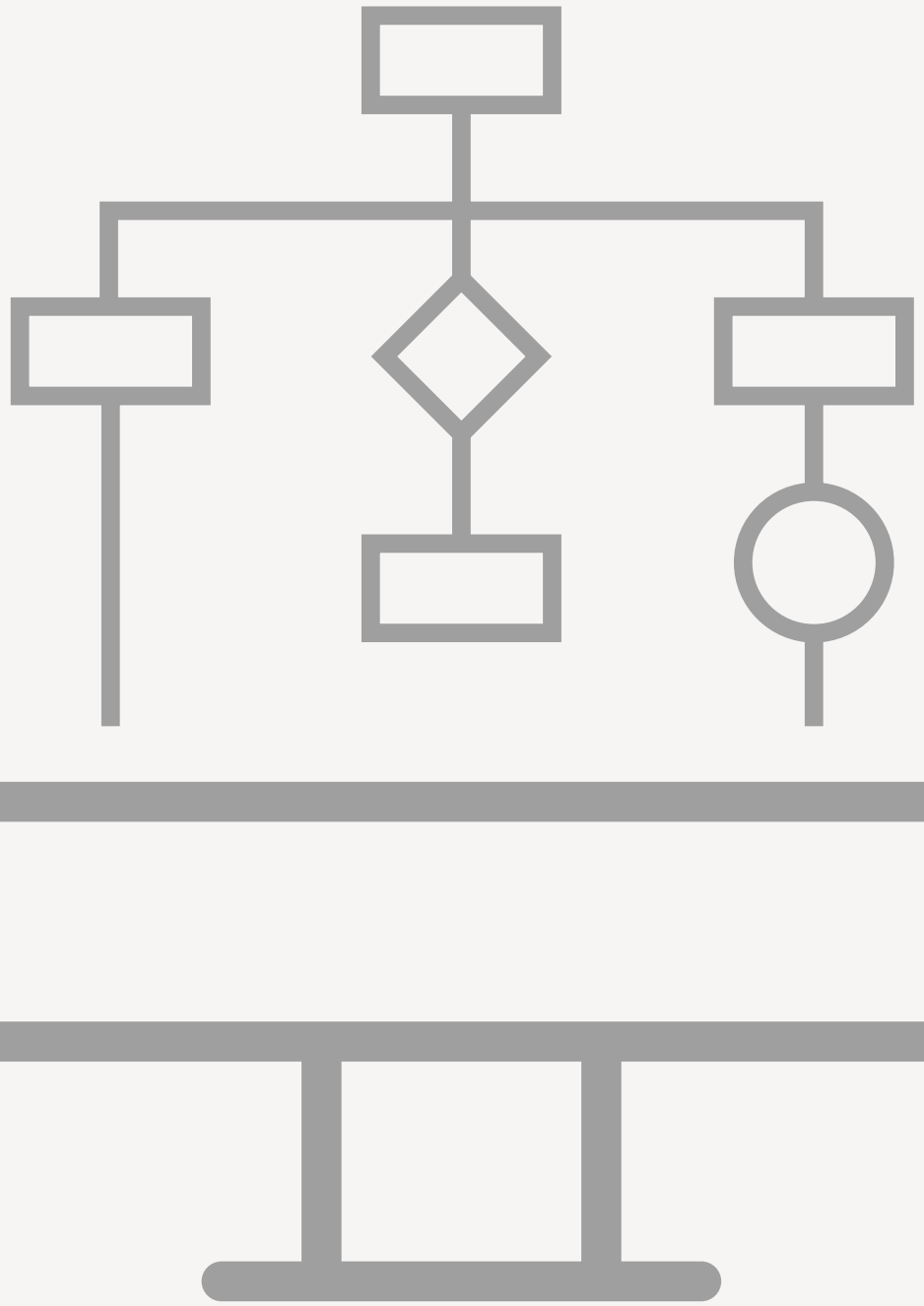
Industrial production manager
ISCO 1321s

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

▲ ACCESAȚI INDEXUL

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.

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

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.

	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.

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

Hazards and risks changes

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

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

Skills and competences needs

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

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

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

Supply chain manager ISCO 1324s

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

Tasks changes
Current and forecasted tasks changes.

Hazards and risks changes
Current and forecasted risks changes.

Skills and competences need
Forecast of training new needs.

Supply chain manager ISCO 1324s

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

Tasks changes

Hazards and risks changes

Hazards and risks comments

Skills and competences needs

ACCESAȚI ÎNDEXUL

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		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 purchasing, storage and distribution strategies, policies and plans.		●	●	●	●						●		●	●	●	●	●		●	●	●	●		
B	Preparing and implementing plans to maintain required stock levels at minimum cost.		●	●											●	●		●		●	●	●	●		
C	Negotiating contracts with suppliers to meet quality, cost and delivery requirements.		●	●	●	●								●	●	●	●	●		●	●	●	●		
D	Monitoring and reviewing storage and inventory systems to meet supply requirements, and control stock levels.		●	●											●	●		●			●	●			
E	Overseeing the dispatch of road vehicles, trains, vessels or aircraft.		●	●											●	●		●		●	●				
F	Operating recording systems to track all movements of goods, and ensuring reordering and restocking at optimal times.		●	●											●	●		●		●	●	●			
G	Liaising with other departments and customers concerning requirements for outward goods and associated forwarding transportation.		●	●											●	●		●		●	●	●	●		
H	Overseeing the recording of purchase, storage and distribution transactions.		●	●											●	●				●	●	●			
I	Establishing and managing budgets, controlling expenditure and ensuring the efficient use of resources.		●	●										●	●	●		●		●	●	●			
J	Establishing and directing operational and administrative procedures.		●	●											●	●		●		●	●	●			
K	Planning and directing daily operations.		●	●											●	●		●		●	●	●			
L	Overseeing the selection, training and performance of staff.		●	●				●	●	●	●	●			●	●	●	●		●	●	●	●	●	

*McKinsey center and Ellen MacArthur Foundation

Tasks changes

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

2025/30

Occupational profile

Description forecast of the occupational profile in 2030

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

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

Supply chain manager
ISCO 1324s

2020
Occupational profile

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

New categorization of hazards

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

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

Hazards and risks changes

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

2025/30

Occupational profile

Description forecast of the occupational profile in 2030

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

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

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

Hazards and risks changes

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

2020 Current situation	2025-30 Situation forecast
Work system/work area: office work, business trips, contact with clients and business partners, use of complex software.	Work system/work area: office work, business trips, contact with clients and business partners, use of complex software, use of digitalized tools and circular economy-oriented strategies.
Mechanical hazards	
• Slips and trips, obstacles, table edges.	• 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

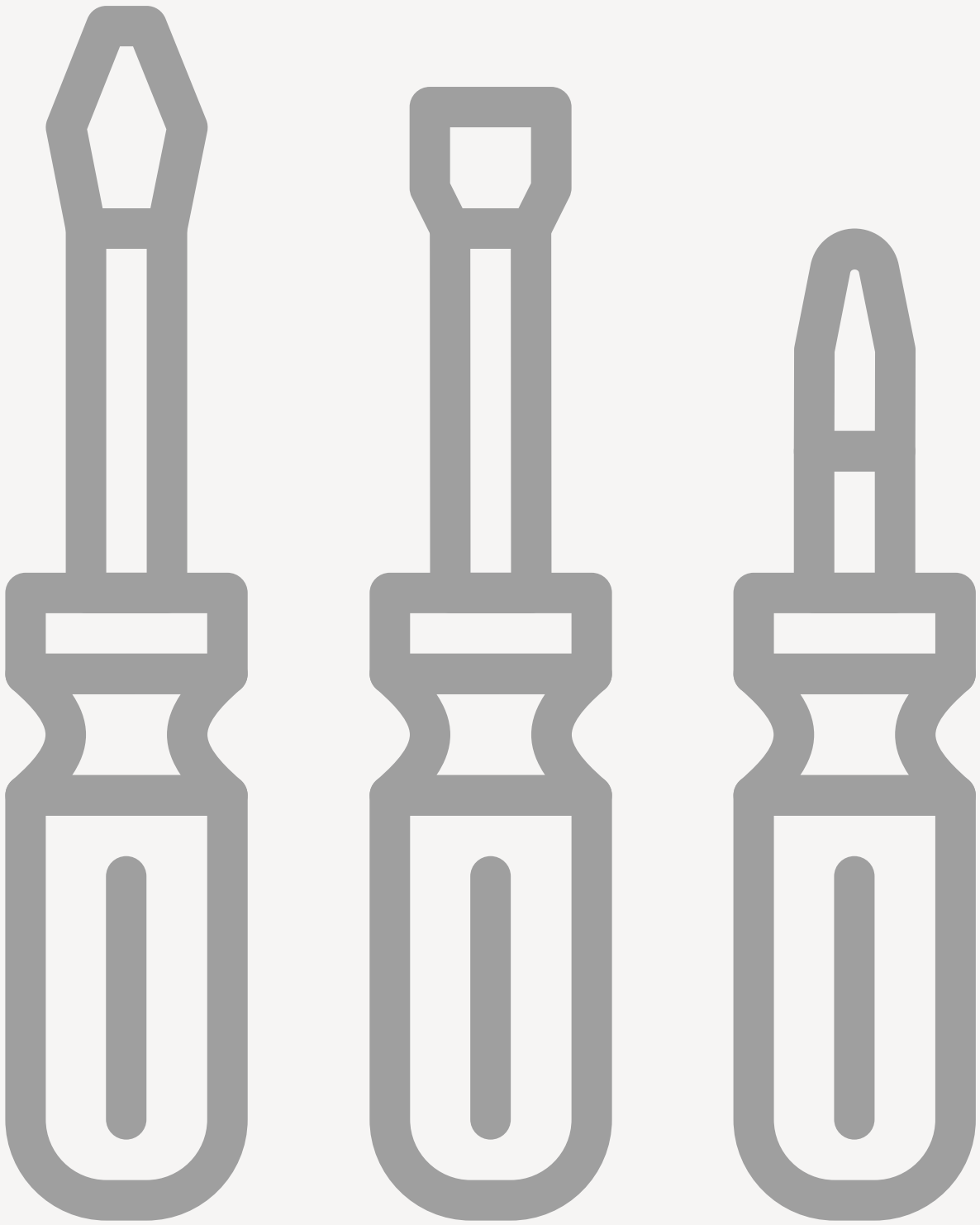
Maintenance & repair engineer
ISCO 2141s

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

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

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.

Maintenance & repair engineer ISCO 2141s

2020
Occupational profile

Current profile description
Maintenance and repair engineers focus on the optimization of equipment, procedures, machineries and infrastructure. They ensure their maximum availability at minimum costs.
- Works in accordance with basic health and safety regulations, including environmental protection and efficient energy use.
- Works in a customer-oriented manner.
- Considers cost- and time-effectiveness when planning and organizing his/her work in his/her area of influence.
- Contributes to continuous improvement of work processes in the company.
- Coordinates work with the rest of the team, report to his/her team leader.
- Cooperates with other departments (administrative, commercial and technical services).
- Assists in the implementation of quality assurance activities.

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

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

Hazards and risks changes

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

	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	●	●		●	●	●	●		●		●

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.).

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.

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

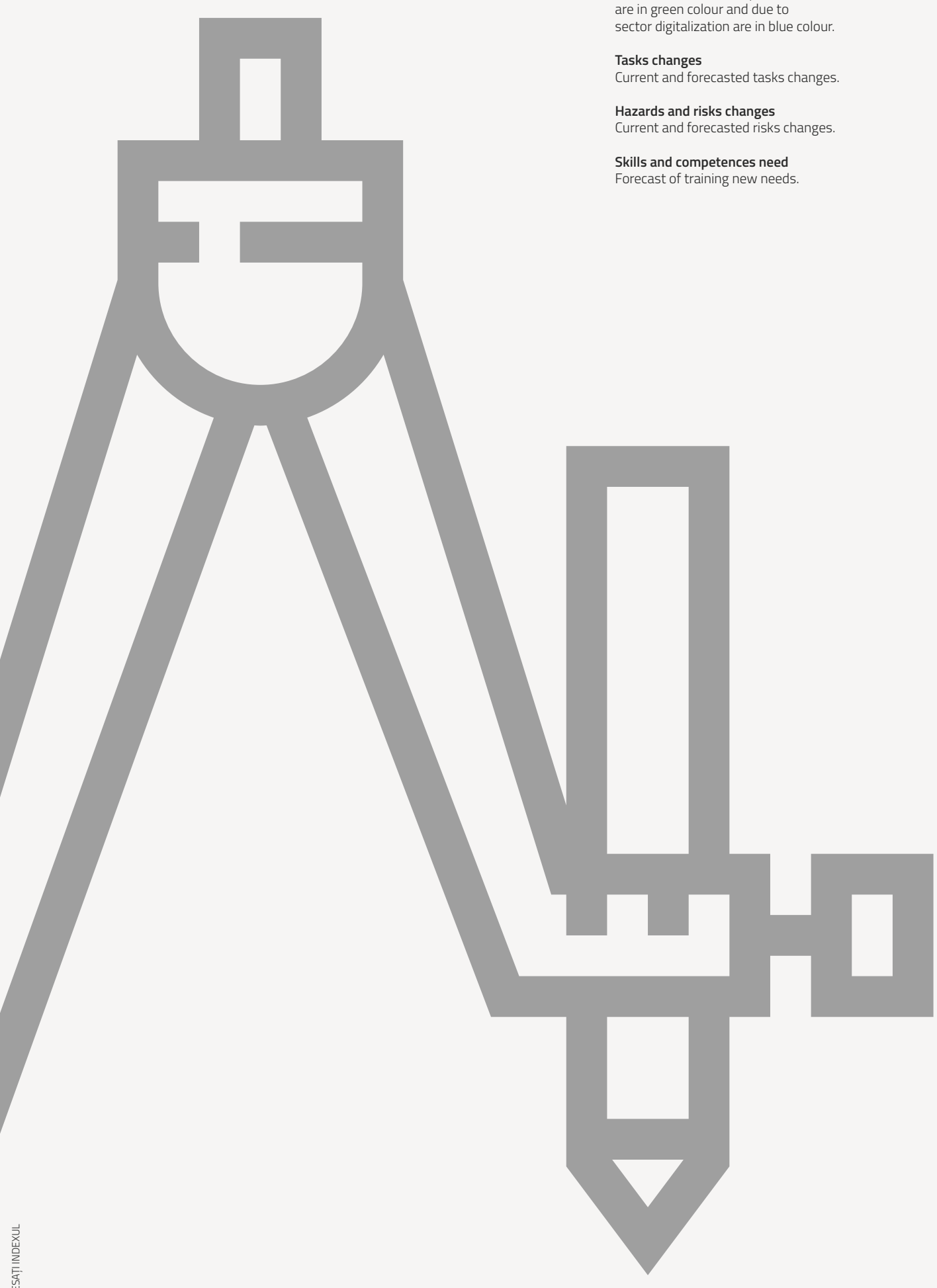
Furniture designer
ISCO 2163s

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

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.

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

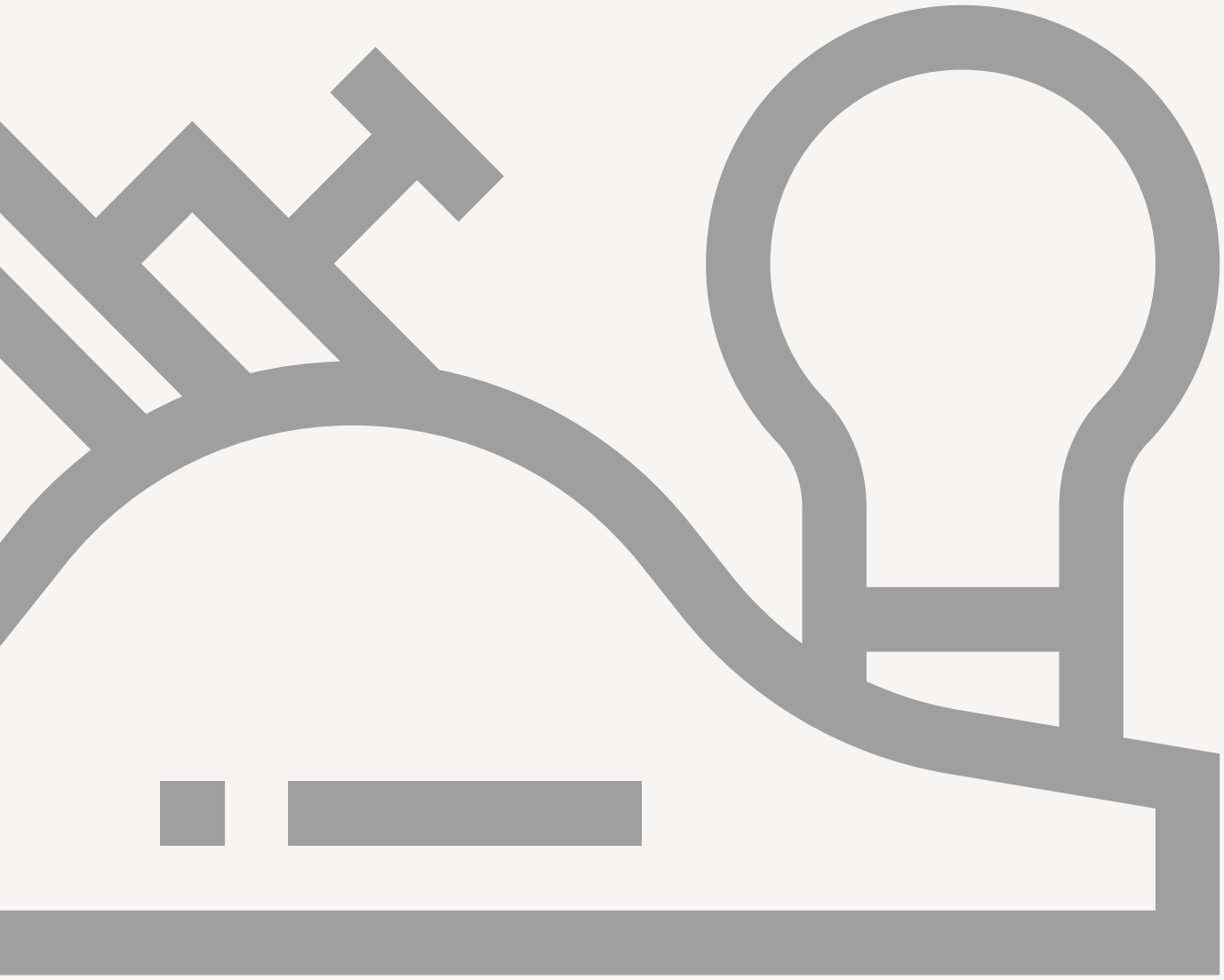
Cabinet-maker and related workers
ISCO 7522

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

▲ ACCESAȚI INDEXUL

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

2025/30
Occupational profile

Description forecast of the occupational profile in 2030
Cabinet-makers and related workers make, decorate and repair wooden furniture, carts and other vehicles, wheels, parts, fittings, patterns, models and other wooden products using highly digitized, connected, ecoefficient and automated woodworking machines and machine tools as well as specialized hand tools.
- Works in accordance with basic health and safety regulations, including environmental protection and efficient energy use.
- Uses digitization tools to work in a customer-oriented manner.
- Considers cost, environmental impact and time-effectiveness when planning and organizing his/her work in his/her area of influence.
- Contributes to continuous improvement of work processes in the company.
- Coordinates work with the rest of the team, report to his/her team leader.
- Cooperates with other departments (administrative, commercial, ICT and technical services).
- Assists in the implementation of quality assurance and sustainability activities.
- Assists in the reduction of the environmental impact of the manufacturing, repair, remanufacturing or recycling processes (e.g. waste generation or energy use reduction, etc.).
- Applies a life-cycle thinking and favour the future disassembly of the product for maintenance, repair, reuse or recycling.

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

Cabinet-maker and related workers ISCO 7522

2020
Occupational profile

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

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

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	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			●	●		●	●			●	●						●●	●●					●	●	●		●	●	●	●	●		●				●

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

Hazards and risks changes

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

2025/30

Occupational profile

Description forecast of the occupational profile in 2030

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

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

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

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

Hazards and risks changes

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

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

2020 Current situation	2025-30 Situation forecast
Work environmental hazards	
• Work environmental hazards: poor lighting, climate and temperature. **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

▲ ACCESAȚI INDEXUL

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.

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

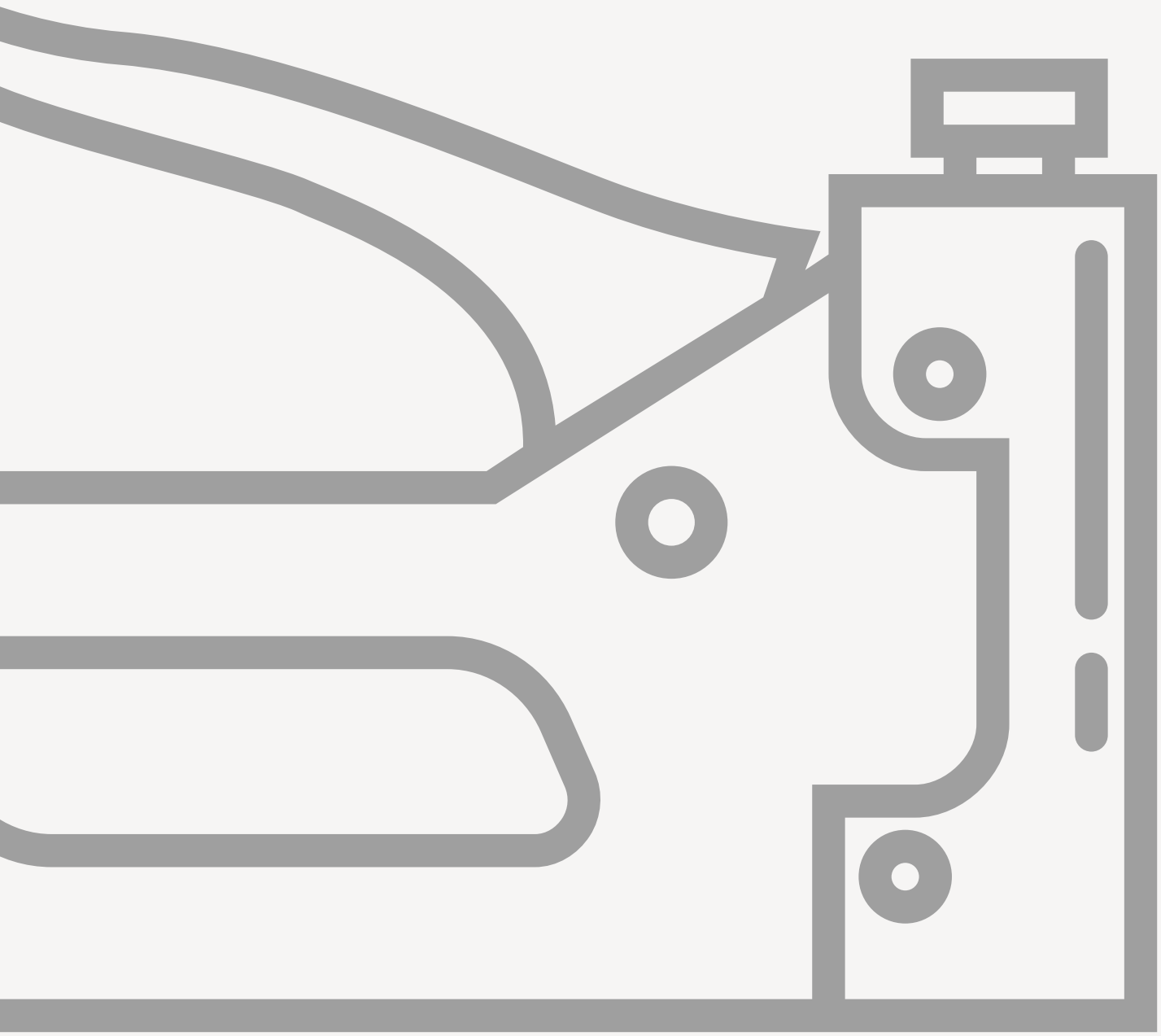
Upholsterer and related workers
ISCO 7534

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
ISCO 7534

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

Tasks changes

Hazards and risks changes

Hazards and risks comments

Skills and competences needs

▲ ACCESAȚI INDEXUL

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.

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- 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.	• Working method: working with colleagues, digital equipment, cognitive interactions with autonomous technologies. The use of cobots and other digital techniques may increase the risk of working alone and feeling isolated. Cognitive interactions between a robot and a human worker can lead to mental stress. Long period of concentration working with computer and new software and performing multitasking. Increased demand on flexibility as workers may perform some tasks from everywhere with mobile devices. Workers are also at risk of being permanent available outside working hours.
Effects: stress, burnout and emotional distress, suffering from depression, cardiovascular problems, sleep disorders.	**Effects**: stress, burnout and emotional distress, suffering from depression, cardiovascular problems, sleep disorders.

Skills and competences needs

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

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

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

Wood processing plant operator
ISCO 8172

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

Tasks changes
Current and forecasted tasks changes.

Hazards and risks changes
Current and forecasted risks changes.

Skills and competences need
Forecast of training new needs.

Wood processing plant operator
ISCO 8172

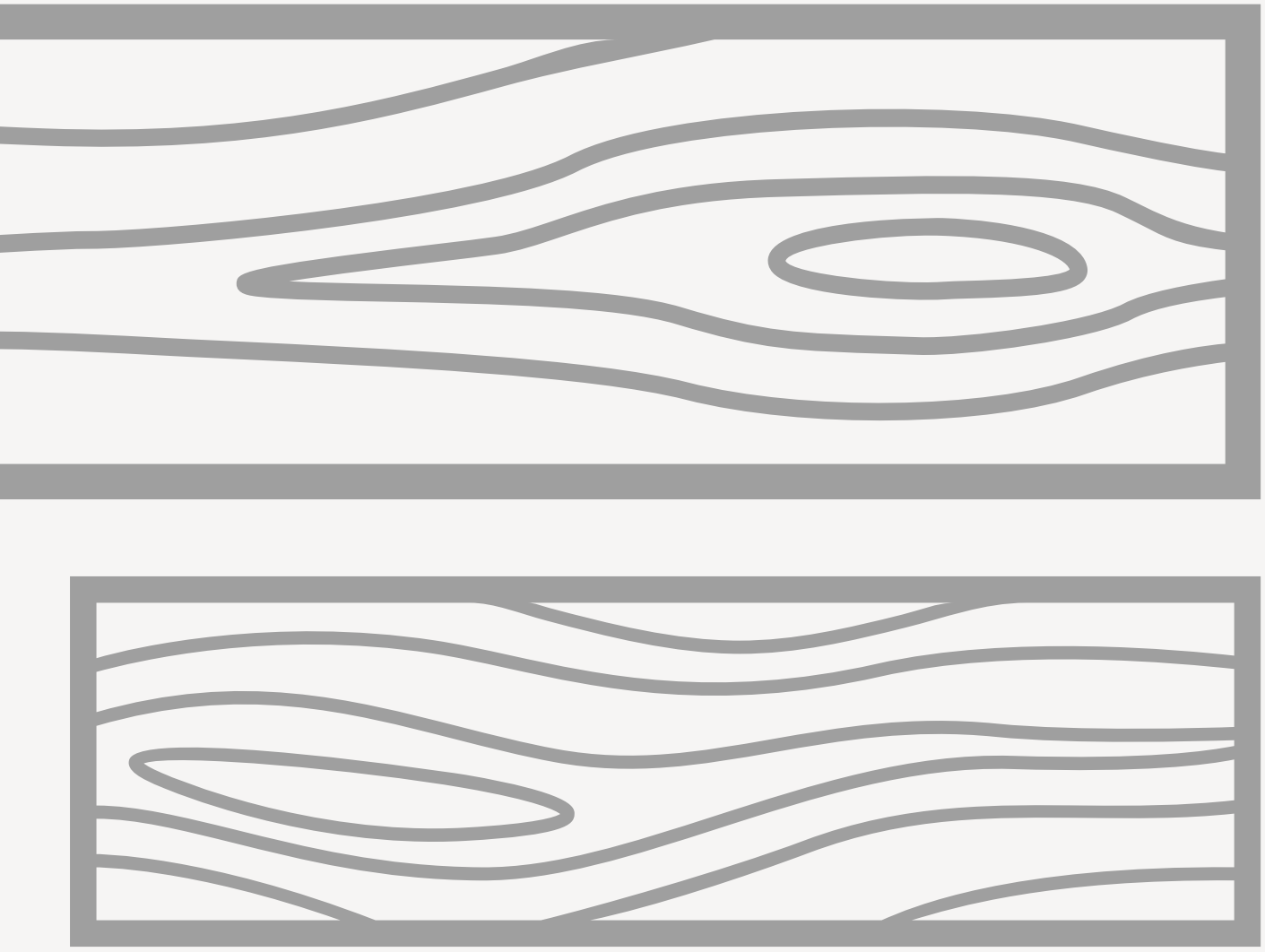
Unfold this to see the current occupational profile description and its tasks and to relate them to the following green table and first yellow table.

Tasks changes

Hazards and risks changes

Hazards and risks comments

Skills and competences needs



▲ ACCESAȚI INDEXUL

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.

Wood processing plant operator ISCO 8172

2020
Occupational profile

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

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

New categorization of hazards

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

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

Hazards and risks changes

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

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.).

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

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: 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.

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

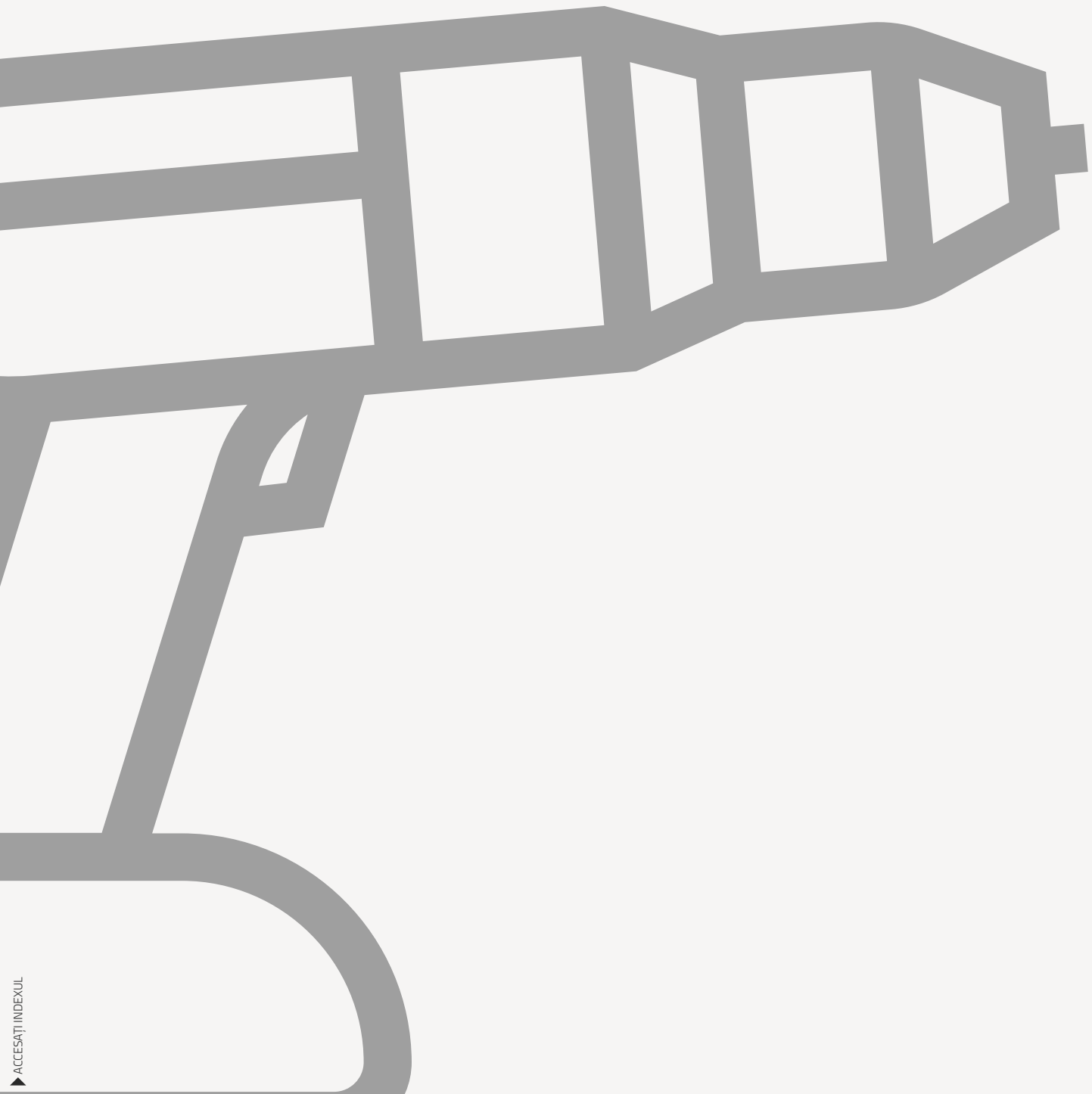
Furniture assembler
ISCO 8219s

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.



▲ ACCESAȚI INDEXUL

Furniture assembler
ISCO 8219s

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

Tasks changes

Hazards and risks changes

Hazards and risks comments

Skills and competences needs

Furniture assembler
ISCO 8219s

2020
Occupational profile

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

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

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

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	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	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			●	●	●		●			●				●			●	●					●	●	●		●			●	●		●		●		●

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

Hazards and risks changes

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

	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.

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.

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

ACCESAȚI INDEXUL

Factory hand ISCO 9329

2020
Occupational profile

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

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

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

*McKinsey center and Ellen MacArthur Foundation

Tasks changes

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

2025/30

Occupational profile

Description forecast of the occupational profile in 2030

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

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

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

Factory hand ISCO 9329

2020
Occupational profile

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

- Works in accordance with basic health and safety regulations, including environmental protection and efficient energy use.
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- 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

Finlanda
bit.ly/39qFe6o

Suedia
bit.ly/2Xywndm

Norvegia
bit.ly/3i91XI1

Regatul Unit
bit.ly/2XzY1XB

Danemarca
bit.ly/38CyqmW

Irlanda
bit.ly/39I6duz

Olanda
bit.ly/3qj5Woy

Belgia
bit.ly/3i8MRlW

Elveția
bit.ly/3i8eoE5

Liechtenstein
bit.ly/3qgl8T7

Franța
bit.ly/2Lw2Ezp

Portugalia
bit.ly/3bGGsNP

Spania
bit.ly/2XBbGxn

Italia
bit.ly/2LI5nvD

Bosnia si Herțegovina
bit.ly/35DH42J

Muntenegru
bit.ly/3ibgy64

Albania
bit.ly/35CGimv

Cartografierea inițiativelor UE în domeniul economiei circulare

În ultimii ani, orașele, regiunile și țările europene au început să dezvolte și să implementeze strategii dedicate economiei circulare. Începând cu anul 2014, au fost adoptate 33 de strategii și alte cel puțin 29 sunt în curs de dezvoltare.

Am elaborat un raport specific „Colecție de inițiative relevante care susțin economia circulară în UE", care deși nu se dorește a fi o listă exhaustivă, conține totuși exemple de abordări diferite pentru promovarea economiei circulare preluate din mai multe state membre UE. Cele mai multe dintre ele se axează pe eficiența resurselor și reducerea deșeurilor, însă și alte teme, cum ar fi obiectivele de dezvoltare durabilă sau schimbările climatice sunt, de asemenea, vizate de unele dintre aceste inițiative. Raportul complet poate fi consultat la: bit.ly/2KqAu8l

Link-urile de pe această hartă vă permit să accesați rapoarte specifice elaborate de EIONET, care conțin o prezentare generală a politicilor, abordărilor și obiectivelor în 32 de țări europene în legătură cu eficiența resurselor și economia circulară, precum și gradul lor de dezvoltare și implementare.

Alte surse relevante de informații utilizate pentru elaborarea raportului cu privire la inițiativele, strategiile și analizele în domeniul economiei circulare sunt:

- Strategii și foi de parcurs cu privire la economia circulară în Europa: Identificarea sinergiilor și a potențialului de cooperare și consolidare a alianțelor - Studiu realizat de Comitetul Economic și Social European: bit.ly/2NchxqZ
- Platforma europeană a părților interesate din domeniul economiei circulare: bit.ly/3bRv8hM

Estonia
bit.ly/3oJJrsc

Letonia
bit.ly/3ibevP2

Lituania
bit.ly/3svHRN8

Polonia
bit.ly/3qglh97

Germania
bit.ly/3qhY6vi

Republica Cehă
bit.ly/2N2m67h

Slovacia
bit.ly/2LspqrS

Austria
bit.ly/2LHqt74

Ungaria
bit.ly/3nDPhtV

Slovenia
bit.ly/2LwEMeO

Croația
bit.ly/39wj2b9

Serbia
bit.ly/35BPwQd

Turcia
bit.ly/3nF8A6b

Bulgaria
bit.ly/2LwMjKF

Macedonia de Nord
bit.ly/2LqUfgs

Concluzii

Acceptarea de către producătorii de mobilă a circularității și practicilor circulare va deveni o realitate de vreme ce economia circulară este esențială în abordarea provocărilor climatice și de mediu, iar numărul solicitărilor de contribuții din partea sectorului vor crește constant. Circularitatea este în stadii incipiente, iar rezultatele vor fi observate pe termen mediu și lung.

Două inițiative recente ale UE vor facilita această tranziție către o economie circulară. Pe de o parte, Pactul ecologic European (COM (2019) 640 final), care va sprijini și accelera tranziția industrială a UE către un model de creștere sustenabilă, favorabil incluziunii, și, pe de altă parte, noul Plan de acțiune privind economia circulară (COM (2020) 98 final), în care sectorul mobilei este menționat în mod specific ca unul dintre grupurile de produse prioritare în contextul lanțurilor valorice vizate de plan.

Viziunea promovată de proiectul SAWYER până în anul 2030 a fost formulată după cum urmează:

*Până în 2030, cu un **sector al mobilei în cea mai mare parte digitalizat**, industria producătoare de mobilă pe bază de lemn va oferi **produse și servicii concepute cu grijă pentru mediu**, realizate din **materii prime cu impact redus și trasabile și aplicând procese de fabricație sustenabile**, promovând în același timp și **cele mai bune scenarii de utilizare și recuperare** a materialelor și produselor scoase din uz. Clienții (persoane juridice (B2B) sau persoane fizice (B2C)) vor solicita informații mai detaliate despre produse și **caracteristicile care privesc sustenabilitatea** ale acestora, inclusiv indicatori specifici ciclului de viață, iar capacitatea consumatorilor de a-și impune punctul de vedere va fi cheia atingerii cu succes a obiectivelor de circularitate. Autoritățile (la nivel local, național și european) vor facilita circularitatea stimulând **scenarii durabile pentru expirarea sau scoaterea din uz** a materialelor și produselor pe bază de lemn, extinzând **schemele de achiziții publice și private ecologice** și promovând **politici pentru o utilizare mai eficientă a materialelor**.*

În analiza implementată în cadrul proiectului SAWYER, competențe tehnice un impact mai mare asupra majorității profilurilor ocupaționale evaluate, cum ar fi:

- Trecerea la materialele regenerabile;
- Reutilizarea produselor pe toată durata vieții lor tehnice;
- Prelungirea duratei de viață a produselor prin întreținere și reparații;
- Prelungirea duratei de viață a produselor printr-o proiectare / design care să asigure durabilitatea acestora;
- Creșterea performanței/eficienței produselor;
- Creșterea eficienței proceselor de producție;
- Re-fabricarea produselor și/sau componentelor;
- Reciclarea materialelor;
- Promovarea utilizării în cascadă a lemnului;
- Virtualizarea aspectelor care țin indirect de produs;
- Înlocuirea materialelor vechi cu materiale regenerabile avansate și
- Aplicarea de noi tehnologii.

Pentru a face față provocărilor care vin la pachet cu tranziția la circularitate și pentru a valorifica oportunitățile oferite de aceasta, părțile interesate din sectorul mobilei din UE vor trebui să privească această tranziție ca parte a **Dublei tranziții** (ecologice și digitale) a sectorului, având în vedere strânsa relație de interdependență dintre acestea. După cum au anticipat și rezultatele proiectului DIGIT-FUR, industria producătoare de mobilă din lemn va oferi produse și servicii inteligente și personalizate, bazate pe sisteme digitale de fabricație furnizate de industrii eficiente din punct de vedere al resurselor și sustenabile. O serie de diferite tehnologii (de exemplu, senzori avansați ieftini, Internetul Lucrurilor (IoT)/ Internetul Industrial al Lucrurilor (IIoT), Internetul de nouă generație, analiza datelor, inteligență artificială, Realitatea virtuală (VR)/Realitatea augmentată (AR), roboți colaborativi (coboții) etc.) vor oferi potențiale de afaceri transformatoare, atât în ceea ce privește produsele, care pot fi dezvoltate și realizate, precum și în ceea ce privește procesele de fabricație în sine, pentru cei capabili să le utilizeze. O altă provocare majoră pentru industria mobilei din lemn va fi asigurarea competențelor necesare lucrătorilor pentru a face față în mod eficient acestei transformări digitale. Per ansamblu, tehnologiile din industria 4.0 vor avea un impact semnificativ asupra proceselor de producție din sector în următorii ani și vor fi benefice și pentru tranziția sectorului către o economie mai circulară.

Privind acest peisaj dintr-o perspectivă de ansamblu, Dubla tranziție a sectorului ar trebui să reprezinte cadrul de referință pentru toate viitoarele analize sectoriale, capacitatea companiilor de a-și inova produsele și procesele de producție, modelele de afaceri inovatoare, politicile sectoriale și, prin urmare, dialogul social sectorial.

Din perspectiva digitalizării, industria mobilei se transformă rapid dintr-o industrie tradițională într-un sector industrial care folosește intens și pe scară largă tehnologia informației. Pe baza modificărilor preconizate în profilurile ocupaționale analizate – folosind pârghiile McKinsey și luând în considerare tehnologiile Industriei 4.0 – DIGIT-FUR a anticipat **anumite transformări la nivelul cererii de abilități, cunoștințe și competențe**. Viitorii angajați din industria mobilierului nu numai că trebuie să poată îndeplini eficient sarcinile, dar trebuie să posede și abilitățile și capacitatea de a recunoaște și de a adopta schimbările continue. Nivelul de calificare solicitat va deveni mai mare și mai specializat, deoarece nucleul competențelor devine mai abstract, din cauza digitalizării/computerizării.

Nu există o nevoie crescută de competențe tehnice, dar acestea necesită o integrare completă a tuturor competențelor digitale (relevante). Cunoștințele tehnice rămân esențiale și constituie piatra de temelie; abilitățile cognitive, sociale și comportamentale vor deveni o prioritate. Oamenii nu vor mai fi selectați pe baza diplomelor pe care le dețin, ci în funcție de mentalitatea lor. Fiecare individ va deveni responsabil pentru propria capacitate de a învăța și de a se auto-îmbunătăți.

Pentru anumite profiluri ocupaționale, vor fi necesare **noi seturi de competențe ecologice** în contextul noilor sarcini specifice legate de dezasamblare și reutilizare, re-fabricare, reciclare și reciclare superioară. Aceste noi seturi de competențe sunt în mod particular (mai) importante pentru sarcinile asociate profilurilor „cu caracter practic". Enumerăm câteva în continuare:

- demontarea produselor de mobilier din lemn
- examinarea piesele dezasamblate pentru stabilirea operațiunilor următoare (reutilizare, re-fabricare, reciclare, reciclare superioară)
- repararea pieselor de mobilier din lemn, dacă este necesar

Aceste noi seturi de competențe ecologice vor avea, la rândul lor, un impact, deși nu la fel de semnificativ, asupra acelor profiluri care gestionează și iau decizii strategice în cadrul companiilor. Aceste competențe vin în „completarea" seturilor de competențe existente și necesare profilurilor examinate.

În plus, **abilitățile, cunoștințele și competențe ecologice generice** au fost considerate necesare pentru dezvoltarea socială, economică și ecologică a sectorului mobilierului din lemn. Aceste competențe ecologice generice sunt aliniate competențelor cheie sau competențelor social-culturale, care au fost contextualizate din perspectiva conștientizării aspectelor de mediul și a înțelegerii dezvoltării durabile și a economiei circulare.

Dubla tranziție în industria mobilei ridică **noi provocări pentru sănătatea și securitatea în muncă**. Industria mobilei poate deveni **cu adevărat sustenabilă** (din punct de vedere ecologic, social și economic) doar dacă siguranța, securitatea și bunăstarea **celei mai**

importante resurse de care dispune sunt asigurate: lucrătorii săi - sau cel puțin, nu poate fi sustenabilă fără a le proteja acestora în cel mai eficient mod cu putință securitatea și sănătatea.

Noile tipuri de locuri de muncă, noile procese, noile tehnologii și noile materiale/produse pot afecta securitatea și sănătatea lucrătorilor, însă, cu sprijinul unei planificări și implementări riguroase, **sănătatea și securitatea lucrătorilor pot fi considerabil îmbunătățite**. Din perspectiva digitalizării, roboții și tehnologiile digitale pot face mai ușoară, mai eficientă și mai sigură munca mai solicitantă fizic sau monotonă. Lucrătorii pot fi scoși din medii periculoase, iar senzorii pot indica automat dacă o mașină are nevoie de întreținere, reducând astfel riscurile de avarie și incidente ale echipamentelor. Pericole tipice din industria mobilei, cum ar fi substanțe periculoase, praful, utilajele și sculele periculoase, se vor menține în continuare, dar riscul de a fi expus la riscuri va fi mai redus.

Analiza arată că tranziția către o economie mai circulară va veni la pachet cu **îmbunătățirea mediului global**, însă, în niciun caz, aceste realizări nu trebuie să facă rabat de la sănătatea și securitatea lucrătorilor. Din acest motiv, noi, persoanele interesate din sectorul mobilei, trebuie să ne asigurăm că nici această tranziție, nici noile tehnologii sau procese de lucru pe care le propune nu vin la pachet cu noi pericole. Și trebuie să ne asigurăm în plus și că materialele noi și reciclate nu expun lucrătorii la substanțe periculoase „noi" sau ascunse**. Economia circulară în acest sector**, acordând aceeași atenție și aspectelor legate de sănătatea și securitatea în muncă și celor de mediu, trebuie **implementată prin mașini, procese de lucru și materiale sigure și eficiente**, capabile să reducă riscurile chimice și fizice pentru lucrători. Aplicarea conceptelor privind **proiectarea ecologică** a produselor trebuie să faciliteze operațiunile de recuperare și reparare, reducând riscurile ergonomice, dar și să reducă conținutul de substanțe periculoase, reducând astfel riscurile chimice de-a lungul întregului lanț valoric. Securitatea și sănătatea lucrătorilor ar putea fi îmbunătățite prin integrarea principiilor gestionării SSM în sistemele de management al calității implementate de companii.

Dubla tranziție în sectorul mobilei, dacă nu este ghidată și implementată în mod optim, ar putea da naștere la noi provocări și probleme legate de stres pentru lucrători. Creșterea volumului de muncă și a complexității sarcinilor, programul de muncă excesiv de lung și nevoile de disponibilitate permanentă dau naștere la tensiune și suferință la locul de muncă, conducând la riscuri psihosociale (EUOSHA, 2015). Pentru a evita aceste noi riscuri, **dobândirea de noi cunoștințe și capacități și a flexibilității** necesare pentru a face față în mod corespunzător automatizării din ce în ce mai accentuate, noilor procese și dezvoltării de noi produse devine o nevoie reală cheie pentru toți lucrători din sector.

Rezultatele acestor analize realizate în cadrul proiectului SAWYER sunt utile pentru:

- înțelegerea corespunzătoare a modului în care vor evolua locurile de muncă ale lucrătorilor din sector și siguranța acestora sub impactul tranziției la economia circulară;
- pregătirea companiilor și a lucrătorilor pentru a face față și a valorifica viitoarele provocări și oportunități; și
- consolidarea unei baze mai solide pentru discuțiile și colaborările viitoare în cadrul dialogului social european.

De asemenea, aceste analize combinate privind digitalizarea și circularitatea – Dubla tranziție – prezintă inter-sinergii relevante. De exemplu, în legătură cu:

- modul în care informațiile de mediu despre produse (de exemplu, conținutul de substanțe periculoase, piese reutilizabile, materiale reciclabile etc.) trebuie colectate și comunicate de-a lungul lanțului de aprovizionare până când ajung la client sau la reciclator;
- modul în care trebuie să se facă trecerea de la produse la servicii (virtualizare, dematerializare, servitizare, etc. ...);
- modul în care impactul proceselor de fabricație asupra mediului se poate reduce utilizând noi tehnologii (de exemplu, eficiența energetică, reducerea deșeurilor, optimizarea materiilor prime etc.).

Această analiză sinergică vine să valideze și să consolideze viziunea conform căreia viitorul sector al mobilei din UE va fi afectat semnificativ de Dubla tranziție și că toate părțile interesate vor trebui să facă față cu atenție provocărilor digitale și circulare pentru a putea valorifica la maximum toate oportunitățile pe care această tranziție le oferă.

Recomandări

Calea către o economie circulară **necesită colaborarea diferiților actori**, de la decidenți politici, reprezentații sectorului, experți, mediul academic și consumatori. Pentru a activa și a accelera tranziția către o economie mai circulară, **oferta de produse mai circulare a sectorului** trebuie să se extindă în același ritm cu evoluția **cererii de pe piață** pentru astfel de produse. Pentru a realiza acest lucru, **Furnizorii de educație și formare profesională și factorii de decizie politică joacă un rol cheie** în evoluția viitoare acestor două tendințe cheie și, din acest motiv, în următoarele secțiuni ale acestui document sunt incluse recomandări specifice pentru factorii de decizie politică și sistemul EFP, care îi pot ajuta să atingă aceste obiective relevante.

În ciuda celor deja arătate și a faptului că mai multe dintre recomandările prezentate în continuare se axează pe depășirea provocărilor venite la pachet cu tranziția către un sector al mobilei mai circular, este important să reținem întotdeauna că, la nivel practic, sectorul va fi afectat simultan și concertat de Dubla tranziție prin care va trece (digitală și ecologică). Acest lucru este necesar nu numai pentru a permite părților interesate din sector să depășească provocările cu care se va confrunta sectorul, ci mai ales pentru a le permite să valorifice cu succes oportunitățile oferite de impactul specific și concertat al acestora.

Decidenții politici

Asigurarea succesului tranziției către o economie mai circulară în cadrul Dublei tranziții a sectorului impune **instituirea de norme armonizate la nivel UE/internațional** și ca inițiativele UE să fie puse în aplicare **într-un mod consecvent de statele membre**, reducând riscul de fragmentare a pieței interne și **evitând barierele în calea** liberei circulații a mărfurilor fabricate potrivit conceptelor de durabilitate și circularitate.

Pentru a asigura o bună implementare a inițiativelor UE, la nivelul UE sunt necesare **norme privind economia circulară simple și inteligente, definiții clare** și un **limbaj comun**, mai ales atunci când vine vorba de parametrii care măsoară circularitatea, cum ar fi „durata de viață lungă", „reutilizarea", „reciclabilitatea", printre alții. Aceasta este cheia pentru **furnizarea de informații armonizate consumatorilor**. Inițiativa UE de Politică privind produsele sustenabile trebuie să ofere clarificări și să reglementeze prin norme aceste aspecte. Una dintre pietrele de temelie ale acestei inițiative este reprezentată de extinderea domeniului de aplicare al Directivei privind proiectarea ecologică pentru a acoperi și produsele care nu au un impact energetic, cum ar fi obiectele de mobilier. Gama largă de produse care intră în categoria „mobilier" și diversele materiale utilizate în producția acestora fac acest **sector complex de abordat**. Criteriile de proiectare ecologică/circulară nu vor funcționa în același mod pentru toate produsele. În acest context, va fi important să se ia în considerare complexitatea obiectelor de mobilier, necesitatea unei abordări **pas-cu-pas** în **armonizarea la nivelul legislației** europene și **între diferitele politici**, precum și în **dialogul** care ar trebui să aibă loc cu reprezentații acestui sector. (bit.ly/3a0Gihs)

Când vine vorba de obstacolele care stau în calea proiectării circulare, **problemele majore care trebuie depășite** sunt disponibilitatea **materialelor și pieselor de schimb**, precum și **lipsa informațiilor de la furnizori** despre substanțele de interes și reglementările naționale stricte care conduc la utilizarea substanțelor chimice nedorite (cum este cazul substanțelor ignifuge toxice care sunt adesea necesare pentru a respecta cerințele de inflamabilitate). În acest cadru, Strategia UE privind substanțele chimice pentru sustenabilitate și produse durabile trebuie să promoveze **reducerea substanțelor care ridică motive de îngrijorare** în produsele de mobilier, diminuând astfel și expunerea lucrătorilor la substanțe chimice. După cum a constatat și Alianța pentru Mobilier Fără Substanțe Ignifuge (safefurniture.eu), substanțele ignifuge migrează din produse și se acumulează în mediu, iar utilizarea lor subminează obiectivele unei economii circulare. Aceste substanțe chimice nu au niciun beneficiu dovedit pentru siguranța la incendiu și există numeroase dovezi ale efectelor lor nocive asupra **sănătății oamenilor și a lucrătorilor**, **creșterii toxicității în caz de incendiu** și mediului (bit.ly/2Y6beHN // bit.ly/2KLXjni). Ele reprezintă un **risc evitabil** pentru muncitori în timpul producției, vânzării și prelucrării la scoaterea din uz. Acesta este un risc comun pentru tapițeri, care se așteaptă însă să fie **atenuat sau eliminat complet** odată cu **tranziția** sectorului către o economie mai circulară și presupunând că viitoarele instrumente de politici vor trata și **utilizarea substanțelor ignifuge toxice, de care nu este nevoie** în obiectele de mobilier.

Ca parte a Duble tranziții, tranziția sectorului către economia circulară va depinde și de alți parametri, cum ar fi **intensificarea digitalizării, instrumente inovatoare** și **eforturi continue în domeniul inovării și cercetării**. Aceste eforturi și investiții în circularitate și dezvoltarea de tehnologii mai ecologice trebuie să fie susținute prin **programe de finanțare,** cum ar fi Horizon Europe, etc. Investițiile necesare trebuie să faciliteze această tranziție și să garanteze că se face în beneficiul tuturor actorilor implicați, în special al IMM-uri, și să promoveze colaborarea între companii și părțile interesate. Noua strategie industrială a UE trebuie să promoveze și să faciliteze Dubla tranziție, analizând simultan potențialul digitalizării, dar și al circularității sectorului.

Inițiativele de politici, cum ar fi Pactul ecologic European sau Planul de acțiune pentru economia circulară, trebuie să **stimuleze cererea și oferta de produse circulare de pe piață**, să promoveze **dezvoltarea de noi modele de afaceri**, de exemplu, conceptul de produs-ca-serviciu, să promoveze reutilizarea, recondiționarea, re-fabricarea, reciclarea, modelele de renunțare la posesie, modelele bazate pe îngrijirea, repararea și recondiționarea produselor, răscumpărările de produse sau achizițiile între persoane juridice (B2B).

Datorită impactului enorm al pandemiei COVID19, eforturile instituțiilor UE și ale statelor membre trebuie să se concentreze pe ieșirea din criza socială și economică, utilizând pachetul de stimulare (de exemplu, Următoarea Generație UE, Facilitatea pentru Redresare și Reziliență și Fondul Social European Plus) și pentru a lupta împotriva schimbărilor climatice, a promova digitalizarea și economia circulară și a **facilita instruirea lucrătorilor cu privire la noile tehnologii și competențe ecologice**, în special pentru muncitorii cu calificare redusă, femei, migranți, tineri, dar și pentru lucrătorii mai în vârstă.

Educație și formare profesională (EFP)

Educația este forța motrice a viitorului pentru că este unul dintre cele mai puternice instrumente pentru a genera schimbare. Una dintre cele mai stringente probleme cu care ne confruntăm este modul în care ne putem adapta modul de gândire pentru a face față provocărilor aduse de o lume din ce în ce mai complexă. Trebuie să ne regândim modul de organizare a cunoștințelor. Iar acest lucru presupune doborârea barierelor tradiționale dintre discipline. Trebuie să **reproiectăm politicile și programele educaționale**. Și pe măsură ce punem în aplicare aceste reforme, trebuie să nu pierdem din vedere **obiectivele pe termen lung** și să ne achităm de imensa responsabilitate pe care o avem față de generațiile viitoare.

Dubla tranziție în industria mobilei dă naștere la o **cerere de noi competențe și abilități specifice** pentru forța de muncă. Anticiparea și dezvoltarea de competențe pentru viitor sunt pe esențiale pe această piață a muncii care se transformă rapid și este din ce în mai orientată către ecologie. Aceasta se aplică tuturor schimbărilor în tipurile și nivelurile de competențe necesare, precum și în domeniile ocupaționale și tehnice.

Deseori, oferta actuală de competențe nu se suprapune pe cererea de competențe noi și adaptate. Este un **decalaj evident între competențele necesare** în Dubla tranziție din sectorul mobilei **și oferta actuală de educație.**

UNESCO a descris **Cinci dimensiuni ale ecologizării EFTP (Educație și formare tehnică și profesională)** drept o traducere a celor **trei dimensiuni ale sustenabilității** care trebuie abordate – **de mediu, economică și socială** – într-un cadru esențial pentru înțelegerea abordării Educației pentru dezvoltare durabilă.

În contextul Dublei tranziții, noi am adăugat și dimensiunea digitală.

Pe baza acestor cinci dimensiuni ale ecologizări EFTP, putem recomanda următoarele:

Campus ecologic și digital

Gestionarea campusului în ceea ce privește gestionarea energiei, apei, deșeurilor și poluării.

- Pentru școli și centre de instruire, este aproape **imposibil de ținut pasul cu toate investițiile impuse** de Dubla tranziție, de vreme ce noile tehnologii evoluează din ce în ce mai rapid.

Prin urmare, un campus ecologic și digital ar trebui să se concentreze pe **medii de învățare hibride**, incluzând pe partea de educație și instruire formală, o ofertă de învățare bazată pe muncă, învățare dual și ucenicie. Un campus ecologic și digital investește în metode de învățare digitală, e-learning prin MOOCS (o ofertă masivă de cursuri deschise online) și o programă de învățământ ecologică.

Campusul ecologic și digital este un **campus deschis**, unde companiile la început de drum (start-up) își au locul, unde companiile consolidate sunt invitate să investească, în calitate de partener, în noi tehnologii, în cercetare ecologică și într-o programă nouă și flexibilă.

Programă ecologică și digitală

Integrarea educației pentru dezvoltare durabilă (EDD). Tehnologie ecologică, tehnologie curată, locuri de muncă ecologice și ecologizarea locurilor de muncă existente. Drept urmare, este nevoie de programe și cursuri ecologice, de practici ecologice în sălile de clasă și în ateliere și de o mai bună interacțiune între sector și institutele de învățământ.

Sisteme EFP trebuie să fie **adaptive și în continuă evoluție** (într-un mod inteligent).

Drept sursă de inspirație, vă prezentăm următoarele exemple despre cum să se pot deprinde competențe (mai) ecologice.

- Adaptarea informațiilor de pe piața muncii cu privire la ecologizare și economia digitală în dezvoltarea noilor programe și revizuirea programelor existente pentru a cuprinde și aspecte ecologice și digitale. Acest lucru se poate realiza de comitetele sectoriale, organismele consultative cu liderii industriei (ecologice), campioni ai digitalizării sau comitetele consultative cu întreprinderile locale (pentru adaptare regională, contextul pieței muncii locale etc.).

- Pentru a introduce economia circulară în programa școlilor EPF, reprezentanții întreprinderilor ar putea veni la școală pentru a le vorbi elevilor despre modul în care își realizează produsele. Apoi vor oferi propriile produse elevilor/studenților pentru a fi reproiectate din perspectiva economiei circulare (circlevet.eu – Steve Parkinson).

- Proiectarea și adaptarea sau modificarea programelor de învățământ trebuie să răspundă sau chiar să anticipeze nevoile în schimbare de competențe în contextul Dublei tranziții. Proiectarea programelor și modificarea cursurilor și a rezultatelor învățării în programă, care să fie organizată **modular** sau **pe baza instruirii la locul de muncă** asigură flexibilitatea necesară pentru integrarea noilor cereri de competențe. Multe cursuri și programe sunt deja modificate pentru a integra (unele) aspecte ale economiei circulare, sustenabilității și/sau digitalizării. Dar acest lucru este de prea multe ori doar o preocupare „secundară" și prea limitată. De exemplu, utilizarea lemnului din surse durabile este adesea predată doar la nivel teoretic, fără a fi inclusă o componentă care să privească achiziția resurselor folosite în atelier. Digitalizarea este predată ca un concept, la nivel teoretic, și deseori nu este integrată în utilajele din atelier, unde computerele sunt depășite și inadecvate pentru exigențele aplicațiilor VR/AR .

- Pe lângă adaptarea programei de învățământ pentru studenți, avem nevoie și de trasee de formare adaptate pentru recalificare și formare profesională la locul de muncă prin „perfecționarea" și „recalificarea" forței de muncă.

- Învățarea continuă (EFPC) este, la rândul său, o dimensiune importantă unde pot fi abordate recomandările menționate mai sus cu privire la programă. **Noile metode de implementare a educației** (învățare modulară, la locul de muncă, învățarea la distanță pe web, metode de învățare hibride, instruire în afara campusului etc.) enumerate mai sus pot fi utilizate pentru a oferi **trasee de formare la cerere și personalizate** pentru toți cei interesați. Metoda trebuie adaptată la grupurile țintă specifice și trebuie să se concentreze pe schimbarea mentalității, mai degrabă decât pe aspecte pur tehnice.

- Dubla tranziție trebuie diseminată prin toate catedrele, trebuie integrată în toate specializările și în toate programele de curs.

O astfel de abordare integrată și sustenabilă poate consta în:

- Dezvoltarea competențelor necesare pentru **implementarea** de soluții durabile și digitalizate;
- Corelarea programului/programei cu Dubla tranziție;
- Integrarea în sistemele inter-conectate la nivel global;
- Înțelegerea integrată a sistemelor sociale, economice și de mediu și discutarea soluțiilor practice pentru Dubla tranziție;

- O mentalitate și un proces decizional ancorate în principiile dezvoltării durabile, ca aport la procesul de construire a soluțiilor pentru crizele sociale, de mediu și economice;
- Implicarea studenților în învățarea „pentru", nu doar „despre" Dubla Tranziție.

O comunitate ecologică și digitală

Adaptarea comunității prin consolidarea capacității ei de funcționare armonioasă, tehnologii regenerabile și sprijin pentru obținerea resurselor.

Metodele eficace de anticipare a nevoilor viitoare de competențe includ un dialog susținut între angajatori și angajați, companii și formatori, coordonarea între instituțiile guvernamentale, sisteme informaționale în legătură cu piața muncii, servicii de ocupare a forței de muncă și evaluarea performanței instituțiilor de formare. Este necesară colaborare și cooperare în toate etapele (factorii de decizie, decidenți politici, nivel practic, nivel organizațional etc.). Există o nevoie uriașă de **implicare a tuturor părților interesate**, furnizorilor de formare profesională, partenerilor sociali (firme, organizații și federații patronale și sindicale), universităților și mediului academic, organizațiilor sectoriale, serviciilor publice de ocupare a forței de muncă și tuturor partenerilor guvernamentali relevanți (ministere ale educației, muncii, mediului, digitalizării ...). De exemplu, pentru recunoașterea competențelor, dezvoltarea de **alianțe pentru competențe în cadrul sectorului, dar și la nivel intersectorial.**

O cercetare ecologică și digitală

Stimularea cercetării în domeniile energiei regenerabile, inovării ecologice și reciclării deșeurilor.

În ceea ce privește Dubla tranziție, recomandăm mai multe acțiuni comune de **cercetări pe tema recunoașterii competențelor, dezvoltate în afara traseelor educaționale obișnuite**. Această recunoaștere – care devine din ce în ce mai importantă – trebuie să fie transparentă și să beneficieze de sprijin din partea tuturor părților interesate, inclusiv a partenerilor guvernamentali. După doar câțiva ani de la absolvirea școlii/liceului/universității, cunoștințele și abilitățile dobândite se învechesc datorită mediului în schimbare rapidă în contextul Dublei tranziții. Doar EPT continuă, fie că este formală, informală sau non-formală, garantează validarea pe termen lung a unei diplome/certificări.

O cultură ecologică și digitală

Promovarea unei culturi a valorilor, atitudinilor, eticii și practicilor ecologice.

În ceea ce privește Dubla Tranziție, ne dorim să adăugăm și **o cultură digitală** (atitudine digitală, etică digitală și practici digitale).

Pe lângă această cultură ecologică și digitală, recomandăm adaptarea unei **culturi a învățării în companie**, integrând învățarea informală și cea non-formală. Lucrătorilor trebuie să li se acorde timp sau să fie eliberați pentru a învăța în mod corespunzător și pentru a oferi beneficii companiilor. Mulțumită traselor educaționale flexibile și modulare, la fața locului sau în afara locației, bazate pe experiență practică, în timp util, acolo unde este necesar (la locul potrivit și în formatul potrivit), atunci când este necesar (la momentul potrivit), lucrătorii pot învăța de-a lungul întregii lor vieți și situații profesionale. Provocarea vine din a ne asigura că cursanții **au acces la informații de calitate** (a se vedea alfabetizarea digitală). Forței de muncă cu educație superioară trebuie să i se acorde suficientă atenție. Acești angajați vor deveni responsabili și de formarea forței de muncă cu un nivel mai redus de calificare. **Speranța de învățare crește, și la fel și oportunitățile de învățare**.

Competențe ecologice

Studiile asupra cererii viitoare de competențe validează importanța abilităților socio-culturale, colaborării și competențelor digitale. Competențele ecologice generice definite se referă și la aceste abilități socio-culturale.

Competențele digitale necesare și competențele ecologice generice nu diferă foarte mult. Deseori, contextul și situația sau obiectivul sau ținta sunt cele care pornesc de la un punct de vedere diferit. Tabelul care urmează prezintă competențele digitale generice definite (noi) (în stânga) și competențe digitale necesare (în dreapta), așa cum au fost definite în proiectul Digit-Fur. Deoarece competențele digitale au fost definite într-un mod mai general decât competențele ecologice generice (care sunt mai detaliate), putem face legătura de mai multe ori între competențele digitale și competențele ecologice (cu caractere cursive).

Pe lângă aceste competențe generice socio-culturale, trebuie să integrăm și să încorporăm competențele tehnice ecologice și/sau digitale.

Tabelul 9.- Noi competențe ecologice și corelația acestora cu competențele digitale.

Conștientizarea aspectelor de mediu și disponibilitatea de a învăța	Alfabetizare digitală
Competențe de analiză a sistemelor și riscurilor	Gândirea critică și rezolvarea problemelor
Abilități de inovare	Curiozitate și inovare
Competențe de coordonare, management și afaceri	*Inițiativa și spiritul antreprenorial*
Abilități de comunicare și negociere	Comunicare eficace
Competențe de marketing	*Comunicare eficace*
Abilități strategice și de conducere	*Inițiativa și spiritul antreprenorial*
Competențe de consultanță	*Comunicare eficace*
Competențe de relaționare, informatice și lingvistice	Colaborare în rețea
Adaptabilitate și transferabilitate	Agilitate și adaptabilitate
Abilități antreprenoriale	Inițiativa și spiritul antreprenorial
Competențe legate de cuantificarea și monitorizarea deșeurilor, energiei și apei	Recuperarea informațiilor
Cuantificarea și monitorizarea modului de utilizare și a impactului materialelor în procesele de achiziții și selecție ecologică	*Regăsirea informațiilor*
Minimizarea utilizării materialelor și a impactului acestora (evaluarea impactului)	*Regăsirea informațiilor*

Sistemul ÎPT (învățământ profesional și tehnic) formal

Educația și formarea în sistemul ÎPT (învățământ profesional și tehnic) formal reprezintă mai mult decât orientarea spre piața forței de muncă și rămâne importantă. Noua creștere a **cererii de competențe netehnice corespunzătoare trebuie susținută** într-o manieră mai puternică. În ciuda importanței acestor competențe socio-culturale, sistemul să nu trebuie să piardă din vedere **competențele tehnice de bază**, nevoia de educație tehnică de actualitate fiind permanentă. Nu poți fi cu succes creativ la muncă decât în măsura în care ai și competențele de bază.

- O **mai bună cooperare** între sistemul de învățământ și sector este necesară, în special pentru programele tehnice. Viitorii angajați din sector trebuie să poată îndeplini în mod eficient sarcini, dar au nevoie și de **aptitudini și capacități pentru a recunoaște schimbările viitoare și a se adapta la acestea**. Rolul competențelor și abilităților multidisciplinare crește semnificativ, iar **companiile vor solicita niveluri de calificare mai ridicate și mai specializate**.

- Această transformare la nivelul competențelor subliniază și importanța **profilurilor de calificare profesională** (stabilite de sector), **ca bază a traseelor de învățare** în sistemul de învățământ.

Sistemul ÎPT (învățământ profesional și tehnic) inițial față în față cu sistemul ÎPT (învățământ profesional și tehnic) continuu

- **Sistemele bazate pe cerere**, cum ar fi ucenicia, învățarea duală sau învățarea la locul de muncă, cresc în importanță. Aceste sisteme trebuie implementate în ambele sisteme ÎPT (învățământ profesional și tehnic).

- Sistemele actuale de EFP inițială și de EFP continuă trebuie să **adopte noile tehnologii ecologice și digitale**. Partenerii din educație și furnizorii de formare profesională trebuie să colaboreze îndeaproape cu companiile. Este nevoie de mai mult decât doar de competențe tehnice și cunoștințe specializate specifice Dublei tranziții. Competențele socio-culturale generice definite sunt la fel de importante.

În cele din urmă, putem concluziona că pentru un **sistem de învățământ** actualizat, avem nevoie de **concursul** tuturor părților interesate și al partenerilor pentru a implementa și a integra cu succes noile nevoi de competențe pentru această Dublă tranziție. O colaborare care impune ca întreaga atenție și toate acțiunile părților interesate să fie concentrate într-o manieră complementară și bazată pe colaborare.

Colaborarea între **entități guvernamentale care reglementează și asigura furnizarea EFP** este necesară pentru a integra noile seturi de competențe pentru o lume cu mai multă grijă față de mediu și digitală, deja din etape timpurii, cum ar fi în învățământul primar, iar aceste competențe trebuie dezvoltate în continuare pe durata învățământului secundar.

Colaborarea între **furnizorii de formare și companii** este necesară pentru a asigura trasee educaționale flexibile și modulare, la fața locului sau în afara locație, bazate pe experiență practică, în timp util, acolo unde este necesar (la locul potrivit și în formatul potrivit) și atunci când este necesar (la momentul potrivit).

Colaborarea între **partenerii sociali și asociațiile lucrătorilor** este necesară pentru a sprijini și facilita condiții care permit lucrătorilor să atingă nivelul de profesionalism și să deprindă competențele necesare pentru a face față Dublei tranziții în acest sector. **Forța de muncă** a sectorului va trebui să adopte o nouă mentalitate de învățare continuă (învățare pe tot parcursul vieții). Ei vor trebui să își actualizeze în continuu cunoștințele despre noile riscuri privind sănătatea și securitatea la locul de muncă și să acționeze în consecință. Per ansamblu, fiecare persoană va deveni responsabilă de propriile sale abilități și competențe viitoare.

Împreună, în cadrul unor parteneriate între angajatori, guvern și institutele de educație, putem lucra la dezvoltarea competențelor solicitate pentru Dubla tranziție, pentru a anticipa, construi și îmbunătăți competențele tuturor părților interesate (profesori, studenți, părinți, angajatori, colegi, administrații, etc ...). Astfel, ne putem clădi un viitor luminos în sectorul mobilei.

Pentru că în viitor, fiecare loc de muncă va fi un loc de muncă ecologic și digital!

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